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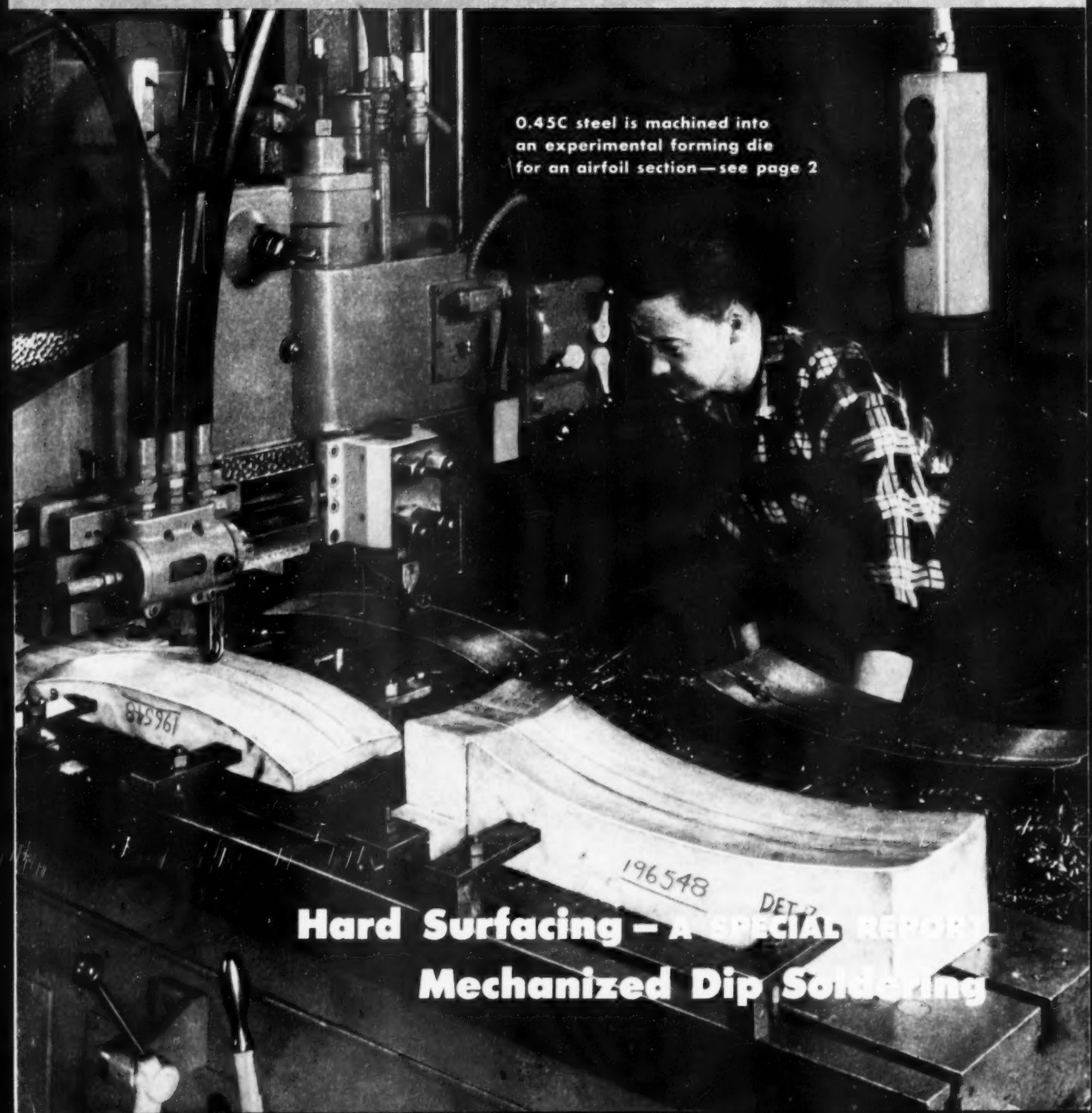
AUGUST 17, 1953

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

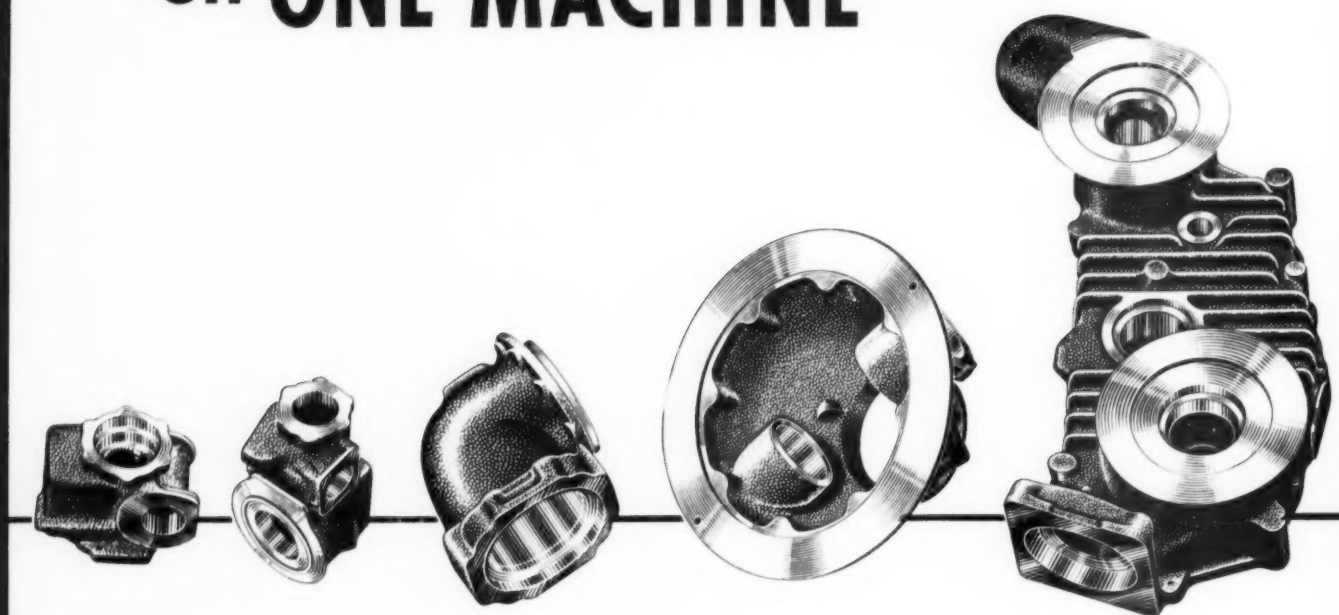


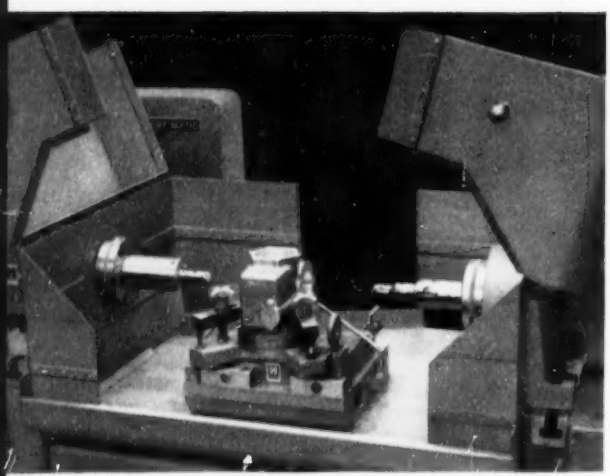
0.45C steel is machined into an experimental forming die for an airfoil section—see page 2

Hard Surfacing — A SPECIAL REPORT

Mechanized Dip Soldering

How to raise a family of five on ONE MACHINE





● On long-run production jobs, the speed, precision and economy of Heald Borizing has become almost a tradition. But what about short-run work on a variety of parts? Here, too, the versatile Heald Bore-Matic can give you faster, better production, at lower cost per part!

Here's a typical example. The Model 322 Bore-Matic shown at the left finishes FIVE different jet engine parts — each with a different fixture and tooling setup. Interchangeable fixtures are platen or angle plate type, as required. In some cases, adapters are used to permit one fixture to accommodate more than one part. Aligning rails help to locate the different fixtures quickly and easily. Both roughing or semifinishing and finishing are done with maximum speed and economy on this one Heald machine.

Long Runs or Short — when it comes to precision finishing, it pays to come Heald.

Internal and Rotary
Surface Grinding Machines
and Bore-Matics

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THE HEALD MACHINE COMPANY

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MAGAZINE OF METALWORKING PRODUCTION

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chips

DUPLIPLANING . . . Our color cover shows an unusual job—planing to contour. It is Rockford Kopy-Kat machining an experimental forming die for an air-foil section. The master is modified plaster, the workpiece 0.45 carbon steel. A stylus transfers the form directly to the tool head through a patented hydraulic duplicator. Convex and concave surfaces are machined, as shown, in one setup, to tolerances of a few thousandths. Subsequent finishing is limited to a light polishing operation.

HARD SURFACE . . . Although McGraw-Hill is a tremendous reservoir of technical as well as economic "know-how", we rarely tap companion magazines for articles. Too specialized, we guess. The exception is our current Special Report, written by Steve Elonka, associate editor of *Power*. It includes all you need to know about hard facing, where to use it, when, and detailed step-by-step instructions. Our own executive editor originated the Special Report idea 20 years ago on *Power*, so this is by way of being a dividend on an idea now widely used in technical magazines.

SOLDERING . . . Dip soldering can be mechanized to save lots of time. K M Lord of GE, Syracuse, tells how it was done on assembly of the TV chassis. Some 400 joints are soldered simultaneously.

FLANGER . . . As the latest in our NTDMA series we describe a special flanging machine built at Vulcan Tool in Dayton. It released a large press for stamping, costs very little, runs faster, is more compact, is indicative of the smart tooling that NTDMA members work out.

KEEP IT STRAIGHT . . . J Zollinger of National Lead straightens out that confusing business of straightening a bent shaft. He explains how to apply heat, and for how long.

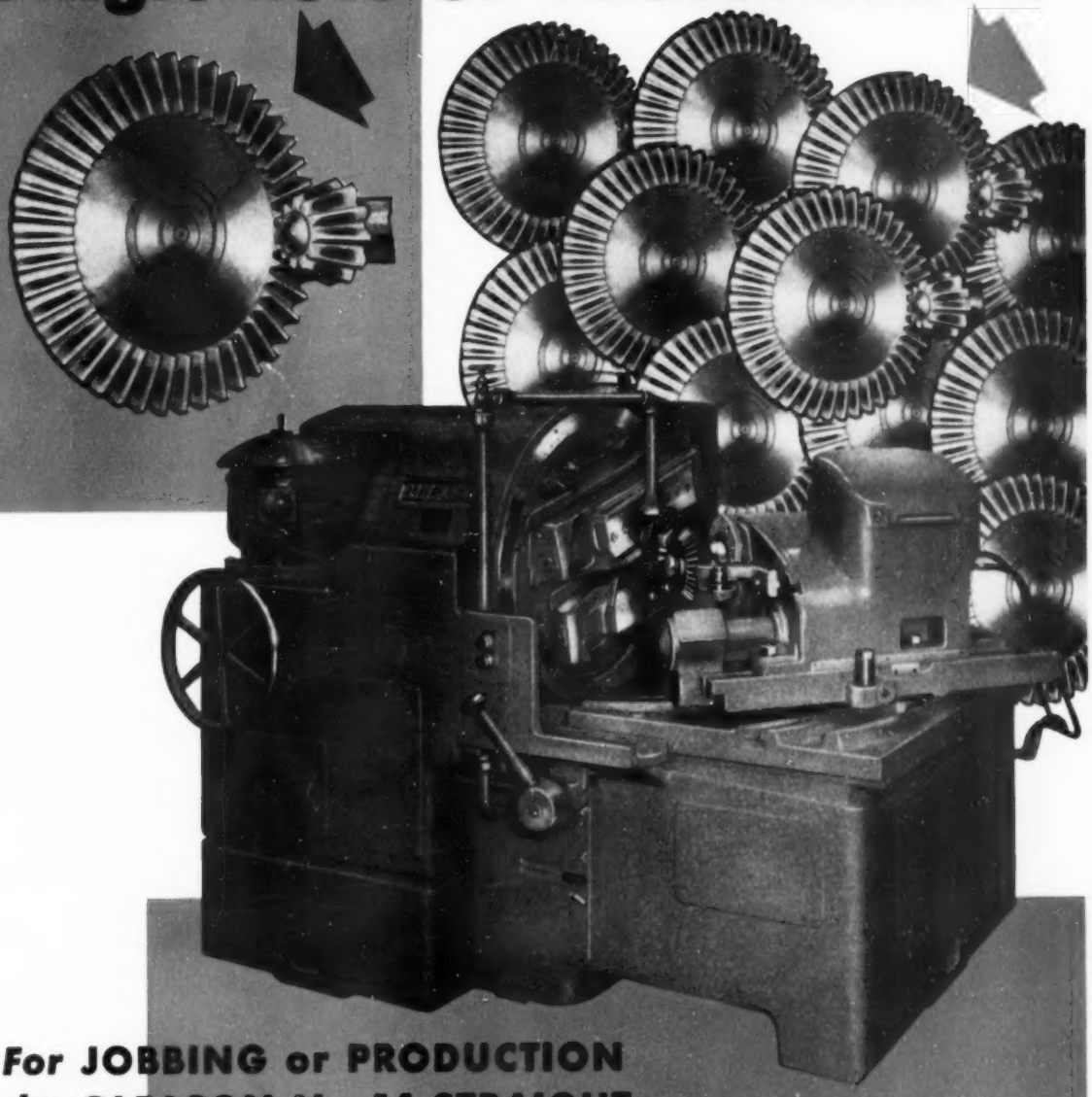
TOOLING . . . We've been to North-American Philips again, this time to find out about making goniometers, those very precise angle-measuring instruments. Our interest in that was secondary, however; what we really went after was the precision-machining techniques that you can apply too. The story leads this issue . . . Stanley Cope goes on with his draw-die design series, too . . . Robert A Petersen, chief tool engineer of Signode Steel Strapping Co, Chicago (see biog), al-o contributes some controversial ideas on tool design-and-make to cut costs. You'll have an opinion, we're sure. What is it?

HANDLING . . . Two articles have to do with that costly subject—handling. One describes two ways of handling chips, showing how coolant affects the setup at two well-known plants. The other shows a way of handling small parts by the barrelfull.

COMING . . . Aug 31 *AM* will bring the third in our series of Special Reports on understanding materials—this one on alloy steels. There'll also be articles on side cams for dies, machinability of high-phosphorus irons, wire-wrapping instead of soldering, welding thin stainless, and on breech bore grinding. The cover shows a precision tool crib—at Purdue.

TOOL MAN . . . Robert A Petersen was born and educated in Hamburg, Germany. He came to the US in April, 1925, and became a citizen in 1931. He has been a toolmaker, toolroom foreman, tool designer, and since 1945, chief tool engineer of Signode Steel Strapping Company in Chicago. He is a registered professional engineer in Illinois, a member of the Amer Assn of Engrs, and of ASTE. He is the author of the controversial article on tool designing in this issue.

Single Lots or Thousands...



For JOBBING or PRODUCTION
the GLEASON No. 14 STRAIGHT
BEVEL GENERATOR LEADS THE WAY

It is universal within its range . . . is easily set up and changed from one job to another . . . equipped with double track cam for roughing and finishing . . . handles gears up to 24" pitch diameter in large or small quantities.

Write for leaflet and see how the No. 14 Straight Bevel Generator will fit your requirements.

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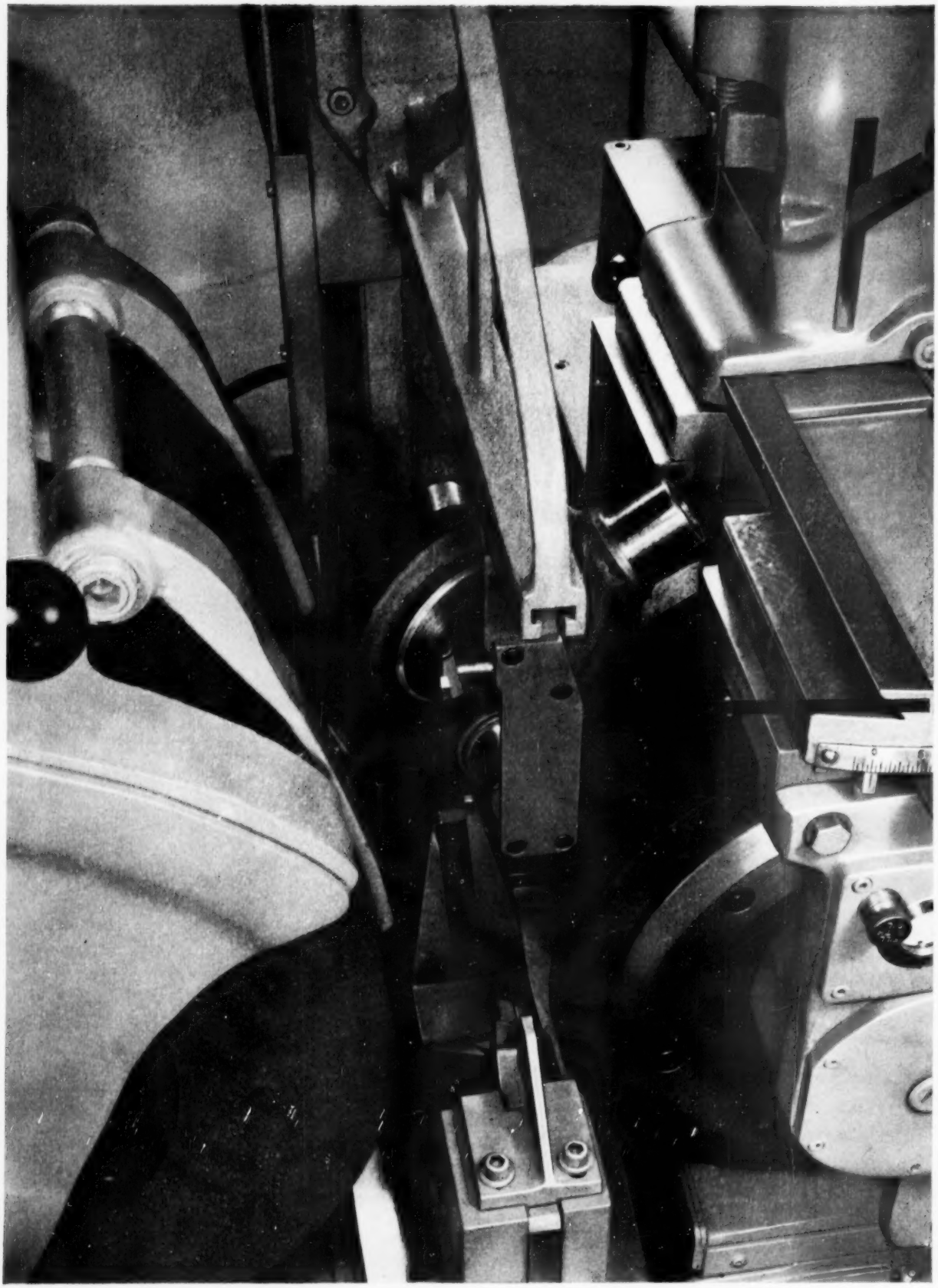
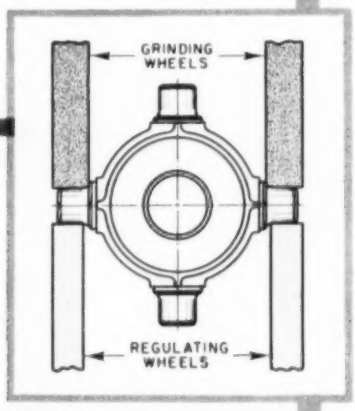


Centerless Grinding Two Diameters Requiring 7X Swing

New applications for CINCINNATI Centerless Grinders are always popping up. The latest is illustrated here . . . a two-wheel setup to grind simultaneously two trunnion diameters on universal joint spiders. Swing required for the center section is approximately 7 times the ground diameters. ¶Cincinnati Application Engineers tooled up a CINCINNATI FILMATIC No. 3 Centerless Grinding Machine for the job. Equipment includes profile hydraulic truing units over the grinding and regulating wheels; special grinding wheel guard and regulating wheel housing to permit loading; automatic infeed attachment; hydraulically operated loading fixture; manually operated grinding wheel spindle reciprocating attachment. With the latter attachment, the operator touches up the shoulder and radius adjacent to the ground diameters. ¶You probably have precision grinding operations in your shop that could be centerless ground on a CINCINNATI at lower cost. It will pay you to reconsider your present methods, and our Application Engineers will help you decide. Meanwhile, you may obtain the CINCINNATI Centerless literature of your choice by writing to the address below. Illustrations and brief specifications in Sweet's Machine Tool Catalog.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI FILMATIC No. 3 Centerless Grinding Machine. You may obtain complete specifications by writing for catalog No. G-570-2.



Drawing of part and arrangement of wheels. Two diameters are ground simultaneously, removing .015", .008", and .003" in three operations, on a CINCINNATI FILMATIC No. 3 Centerless Grinding Machine tooled up by Cincinnati Application Engineers.

FILMATIC

Cincinnati Offers the Only Complete Line of Centerless Grinding Machines . . .

No. 0
Catalog No. G-576-2

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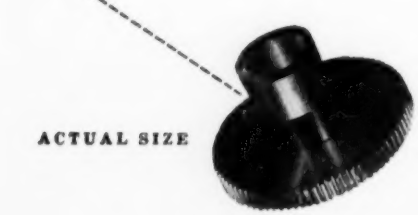
CINCINNATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

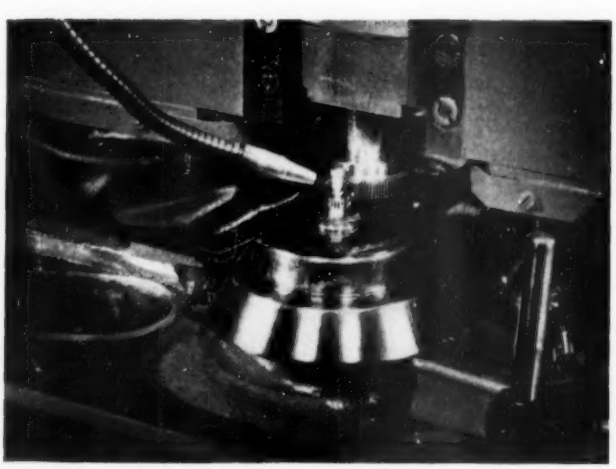
Direct Hits take Fellows-Cut



ACTUAL SIZE

SPECIFICATIONS

Material	Corrosion Resistant Steel 416
Outside Diameter	1.2812 + .000 —.001
Pitch Diameter	1.2500 + .0000 —.0005
Concentricity T.I.R.	.0004"
Diametral Pitch	64
Pressure Angle	14½°
Number of Teeth	80
Face Width	3/16"



FELLOWS CUT...by nine 3" Gear Shapers

Fellows

The FELLOWS METHOD
...in action!

Instrument Gears by the TON

A typical one of Arma Corporation's automatic aiming mechanisms has some 3,500 gears working in combination. These gears deliver motion only. Excessive pitch line runout must be avoided or hits become misses.

a fair question

What is the quickest and most economical way to mass produce this accuracy?

Arma has picked the Fellows Method time and time again. Here are 4 reasons why:

Accuracy—scores of manufacturers in their own field could readily testify to mass production within unusually close tolerances with Fellows equipment.

Speed—a typical gear, specified at left,was cut, shaved and inspected in 4 minutes, 40 seconds.

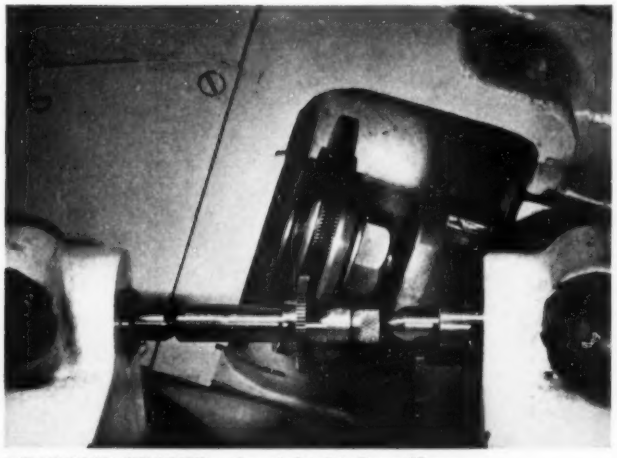
Versatility—the Fellows 3" Gear Shaper cuts gears from 1/16 inch pitch diameter to 3 inch pitch diameter.

Economy—one man runs 3 machines. Easily accessible fixtures cut change-over time.

This is the Fellows Method in action. We would welcome an opportunity to discuss your gearing problems at your convenience.

PRODUCTION DATA

Cutting—	2 Cut Cam .005 Finish Cut	
	Type of Operation	Preshave
	Feed per stroke of cutter	.0045"
	Strokes per minute	700
	Cutting time	**3.5 minutes**
Shaving—	2 Cycle Cam	
	Shaving tool dia.	3.5"
	Shaving tool helix angle	18°
	Shaving tool R.P.M.	252
	Surface speed F.P.M.	231
	Shaving time	**40 seconds**



FELLOWS SHAVED...by eight #4 Gear Shavers

FELLOWS CHECKED...by four 8M Red Liners

GEAR SHAPER COMPANY

Head Office & Export Department: 78 River Street, Springfield, Vermont.
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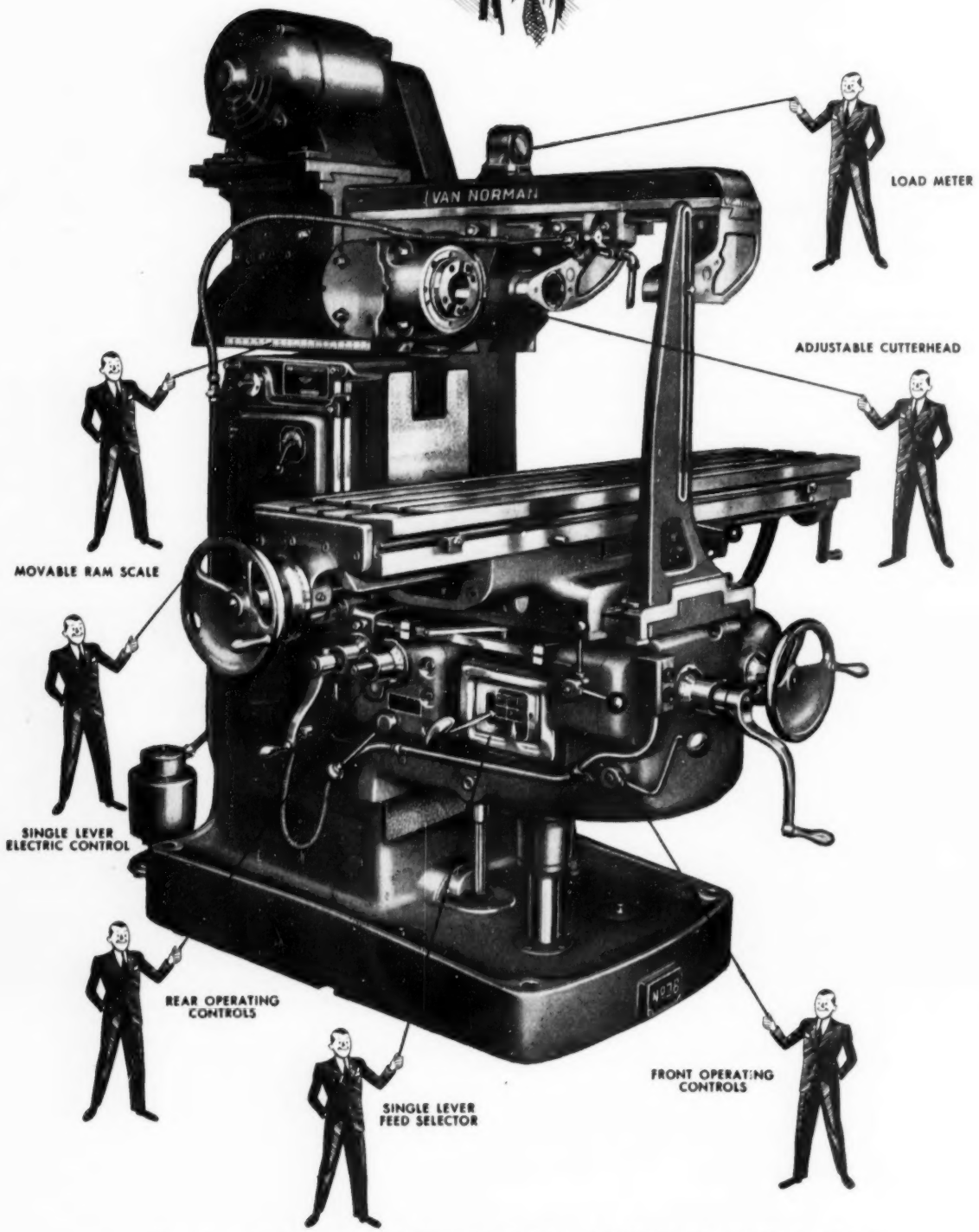
Look at the



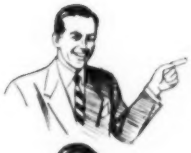
"IT PAYS TO VAN NORMANIZE"

Production Advantages of the

VAN NORMAN

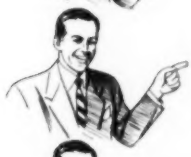
RAM TYPE MILLER

Regardless of the type of plant or the type of work, Van Norman Ram Type Millers can cut your milling costs and speed vital production. These versatile millers reduce idle machine time by as much as 50% because they enable the operator to perform conventional horizontal, vertical and angular milling on *one* machine. Look at what Van Norman Ram Type Millers can do for you —



Adjustable Cutterhead

By merely positioning the cutter head, the operator can perform horizontal, vertical or angular milling . . . the work of three single-purpose machines.



Increased Work Range

Movable ram plus the saddle crossfeed increase the work range and capacity of the miller . . . enable you to handle larger work pieces with ease.

Front and Rear Controls

Operating controls are located at front and rear for ease of operation. They eliminate back and forth operator motion . . . reduce operator fatigue.

Simplified Electric Control

Built-in electric controls simplify operation. Single lever selector controls spindle, feed, and coolant. Push button, on front of knee, starts and stops motors as pre-selected.

Load Meter

Built-in load meter indicates percent of load at which the cutter is operating. It enables the operator to operate miller at maximum efficiency . . . helps to prevent overloading of the miller motor.

Any way you look at it, the Van Norman No. 38 Ram Type Miller is your best buy for cutting costs, increasing production and accuracy.

Van Norman Ram Type Millers are available from 37" to 64" table lengths.

Write for complete information, today.

VAN NORMAN COMPANY

Springfield 7, Massachusetts

A NEW for Cutting Large

WORLD'S LARGEST MANUFACTURERS OF THREAD

LANDMACO

Diameter Threads—

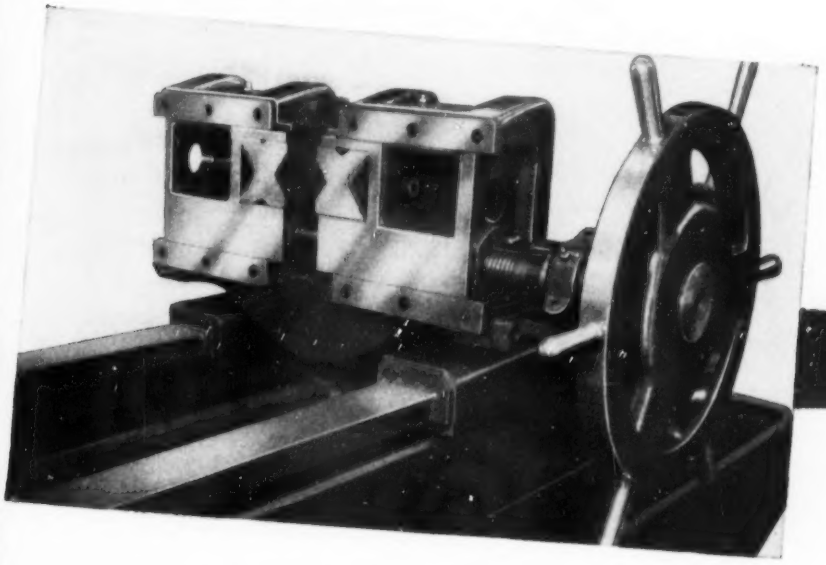
GROUND WAYS • WIDE SPEED RANGE
MORE GRIPPING POWER • 6" CAPACITY

●A New LANDMACO Threading Machine with many improvements and new design features has been developed for heavy-duty precision threading on large diameter work. The first installation of this new LANDMACO is shown threading "Unbrako" socket head screws of TS4140 steel at the Standard Pressed Steel Company, Jenkintown, Pa. 1½" diameter 12 pitch UN threads are being cut 2 29/32" long to a Class 3 fit.

The carriage front, based on a new principle, assures proper work alignment under gripping pressure and gives 60% more gripping efficiency. Heavy hardened and ground rectangular ways firmly guide and support the carriage.

A single gear shift lever is provided for a rapid speed change of 25% for any given spindle speed as determined by the speed change gears in use. Three pairs of speed change gears provide twelve spindle speeds ranging from 9 to 152 revolutions per minute.

This machine is equipped with either the 4" Standard Rotary Head or the new 6" (6-chaser) Lanco Head. It will cut bolt threads from 1½" to 6⅝" in diameter, and pipe threads from 1" to 6" in diameter. Maximum thread length is 29" with leadscrew and 30" without leadscrew.



For more complete information on this **new** LAND MACO Threading Machine, write for Bulletin #H-45.

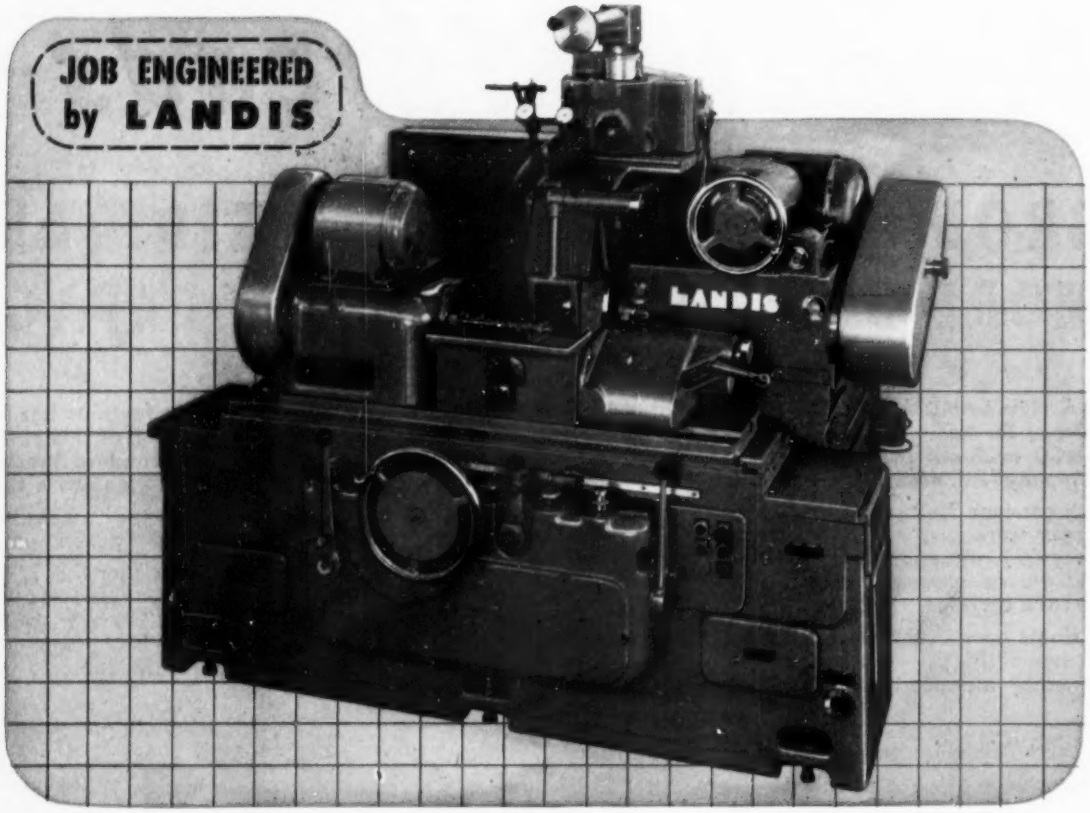
50th ANNIVERSARY 1903 1953

WAYNESBORO PENNSYLVANIA

GENERATING EQUIPMENT

How LANDIS JOB ENGINEERING cuts grinding costs...

Plain Grinder with Spaced Wheels Can Do Work of Two or More Machines



Landis 10" x 18" Type CH Plain Grinder with spaced grinding wheels and hydraulically operated, wheelbase mounted overhead dresser.

JOB ENGINEERED by LANDIS means ideas that will produce the highest return on your investment. It starts with operator convenience, hydraulic controls and simplified maintenance of a *standard* grinder. Then, on the basis of your requirements of finish, tolerance and production, we apply tooling, such as spaced wheels, to increase production and accuracy.

Landis Grinders are engineered to *your* specific requirements. They give you the fastest return on your investment. Send us your prints for tooling and production estimates. Landis Tool Co., Waynesboro, Pennsylvania, U.S.A.

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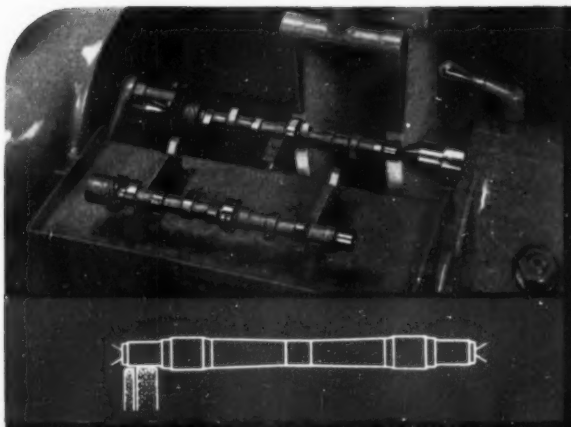
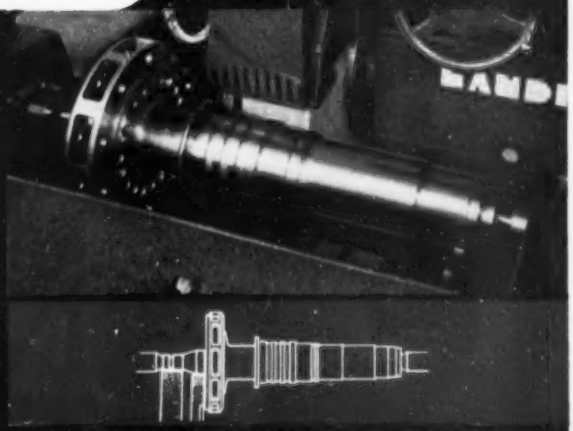
LANDIS

precision grinders

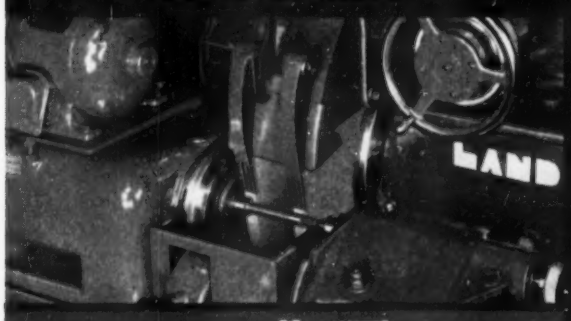
JOB ENGINEERED by LANDIS



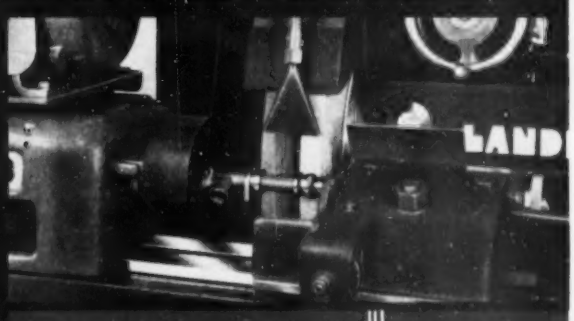
CENTER AND END BEARINGS OF CAMSHAFT GROUND IN ONE OPERATION



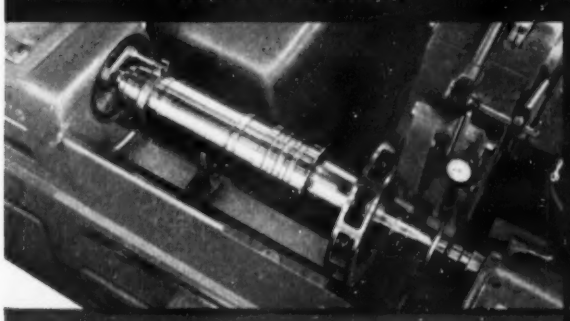
GRINDING VARIOUS DIAMETERS OF PROPELLER SHAFT WITH SPACED WHEELS AND SPECIAL FEED

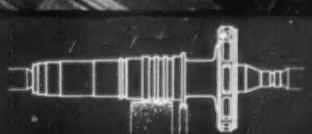


TWO DIAMETERS OF INPUT SHAFT GROUND SIMULTANEOUSLY

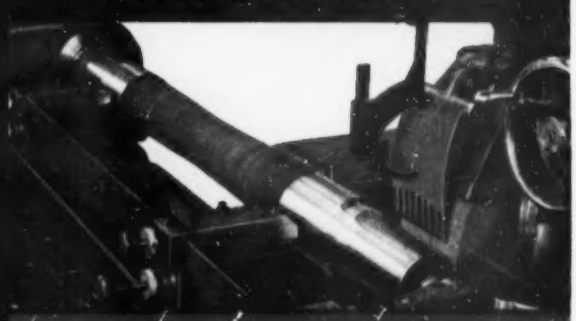


OIL PUMP BODY DIAMETERS GROUND WITH TWO WHEELS OF DIFFERENT GRADES



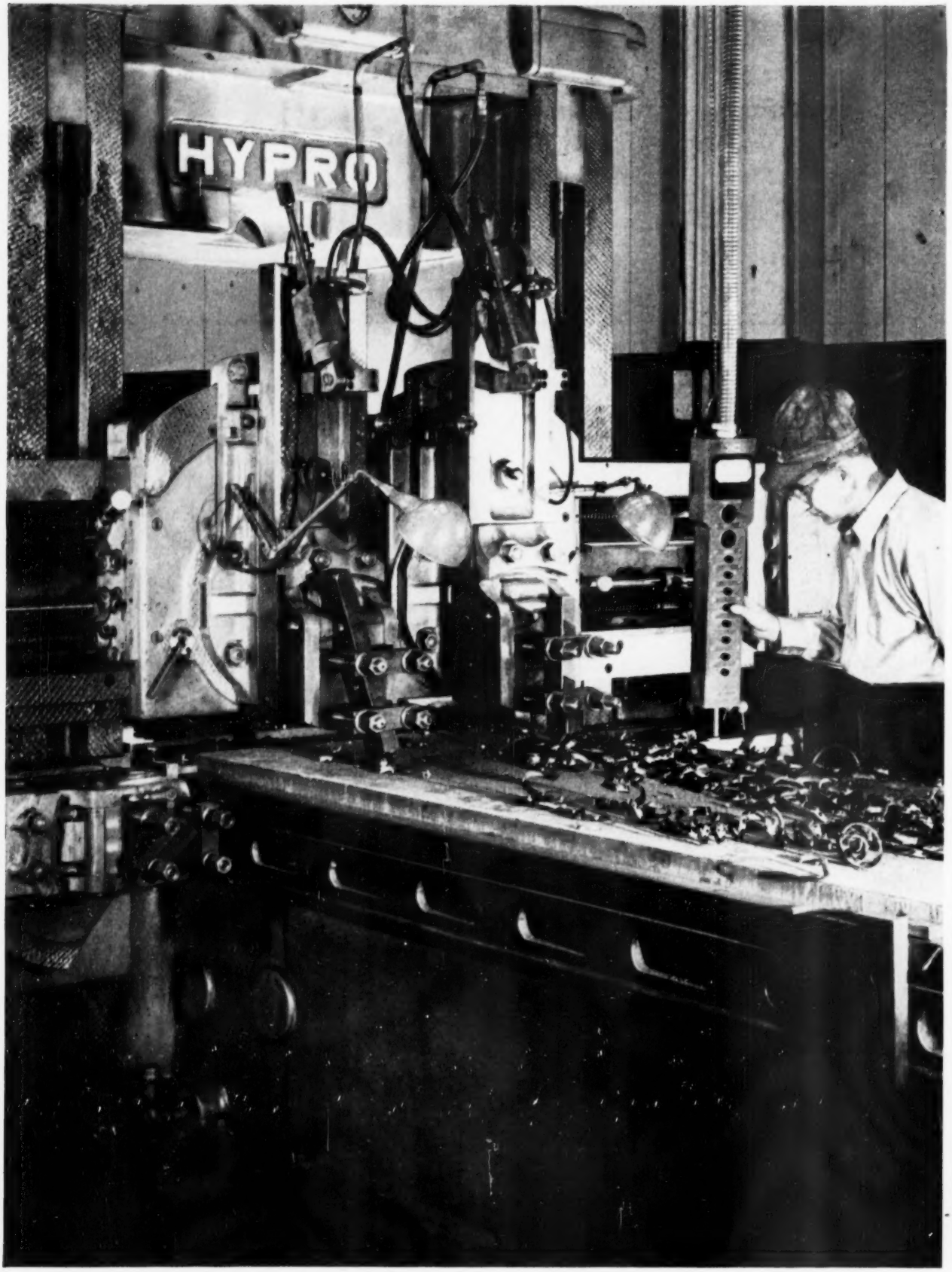


END DIAMETERS OF PROPELLER SHAFT GROUND IN ONE OPERATION



SPACED WHEELS WITH RADIUS ON CORNERS FOR GRINDING RAILROAD CAR AXLES

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA, U. S. A.


HYPRO

Carbide finger... with the Midas touch!

This G & L Double Housing Planer will help you make a handsome profit on every job, big or small. It has the proper power application and extra rigidity necessary to perform carbide planing operations at 300 ft. per minute

If you're searching for a heavy planer that allows you to get the fastest, most economical use of carbide cutting tools, investigate the G&L line of Double Housing and Open Side Planers.

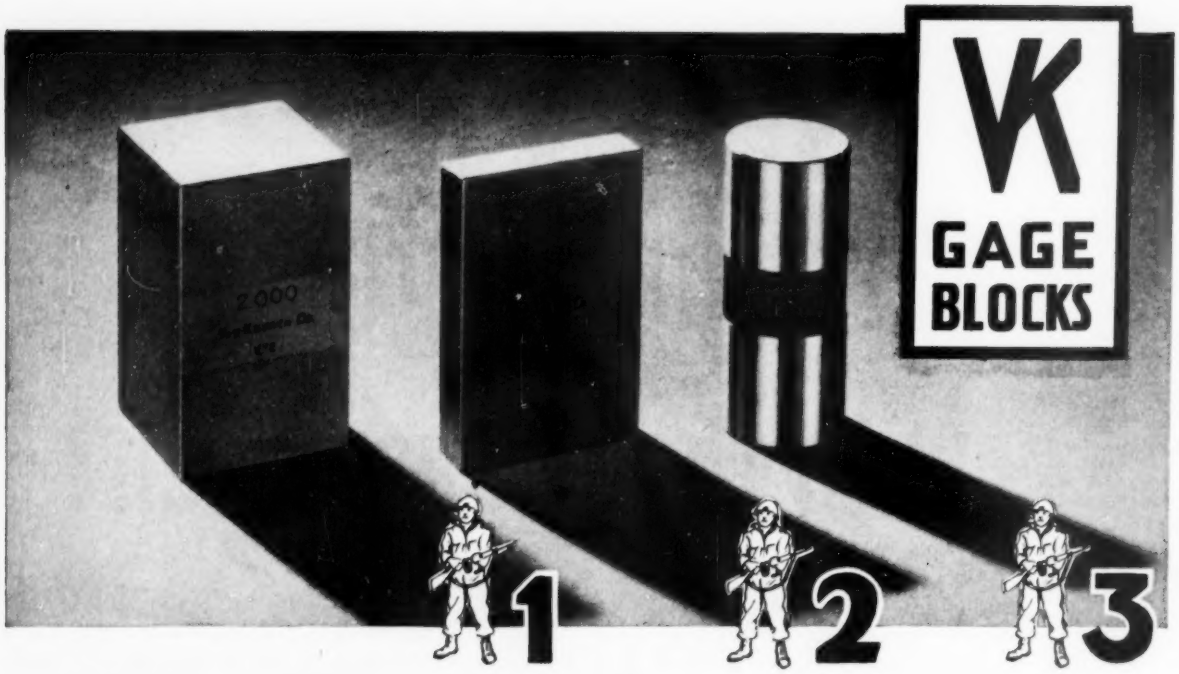
These massive machines offer you many important advantages. In addition to the inherent rigidity of the rail, heads, housings, table and bed — a twin helical gear train table drive provides straight power flow to eliminate side thrust.

G&L HYPRO Double Housing Planers and Open Side Planers are available with working widths up to 144 inches . . . variable voltage drives up to 100 hp . . . bed lengths to suit the particular model. For complete details, see your G&L representative, or write —

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools



SOLDIERS THREE . . . *defending production accuracy*

To meet the requirements of the current defense effort in meeting closest limits of accuracy and protecting production, Van Keuren is currently furnishing three types of gage blocks:

1—SOLID SQUARE MASTER BLOCKS
2—RECTANGULAR REFERENCE GAGES
3—MICROGAGES

Shipment on complete sets of any of these three types can be made within 60 days from receipt of order.

VK Solid Square Master Blocks are accurate to .000004" per inch of length and are designed for laboratory use or to standardize all shop dimensions. Large wearing surface; perfect parallelism. Available in 85- and 41-block sets and guaranteed unconditionally for 5 years not to exceed .0001" in wear.

VK Rectangular Reference Gages are guaranteed accurate to .000008" per inch of length and are designed for the inspection department or precision set up work. They are available in 81-block and 33-block sets. Individual blocks from either of these sets can also be furnished. Certificate of size is also furnished with each set.

VK Microgages are accurate to plus .000012", minus .000008" per inch of length and are designed as working gages for shop use . . . to put accuracy at the machine. Wearing surface is 40% greater than that of rectangular gage blocks hence their long-wearing quality. Available in several set combinations.

Van Keuren Gage Blocks are fully described in Catalog and Handbook No. 35, yours for the asking by writing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

34th YEAR

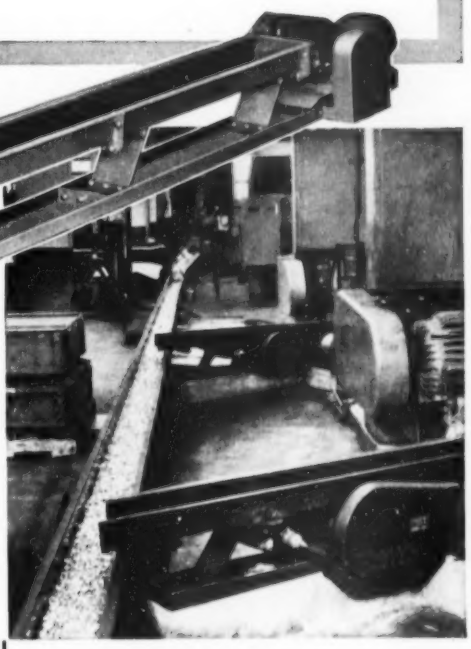
THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

For low-cost chip collection, get FLEXMOUNT Oscillating Conveyors

Now available from stock



Metal-working plant collects aluminum chips with FLEXMOUNT Oscillating Conveyors. Collecting conveyors feed 116-ft. main conveyor carrying chips to disposal.

LOOKING for an efficient, easy-to-install method of handling chips, turnings, blasting shot, punching or stampings? You'll find the answer in the Link-Belt FLEXMOUNT Conveyor, now available from stock. Production-line manufacture of 8, 12 and 18 in. widths assures low costs on these stock sections. It's a simple matter to build up any length desired right in your own shop. For complete information, see your Link-Belt sales office or distributor, or write for Book 2478.

How Positive Action moves materials

Positive-action, constant-stroke eccentric drive provides a powerful, yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges. Resonant spring action of resilient legs cuts power requirements to an absolute minimum.

LINK-BELT

FLEXMOUNT OSCILLATING CONVEYORS

13,300

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

Only FLEXMOUNT gives you these 8 big advantages

1. POSITIVE ACTION. Uniform, continuous chip flow is assured regardless of load. Natural spring action reduces horsepower requirements to a minimum.
2. LEAK-PROOF. Trough is a single piece of metal. No coolant drip between machine and drain point. No return run.
3. COMPACT. A "natural" for restricted space. Opening need be only slightly larger than trough.
4. LONG LIFE. Minimum of moving parts. No joints or bearings in contact with material. The resilient legs that provide spring action last indefinitely.
5. LOW MAINTENANCE. Operates at low speed. Only drive need be lubricated.
6. SAFE. No moving parts in conveying trough.
7. JAM-PROOF. Reduces production stoppages. Handles bolts, nuts, bars, broken tools and even rags.
8. VERSATILE. Various widths, standard lengths up to 100 ft., with one drive. Dividers can be installed to convey simultaneously two or more materials, such as brass and steel chips, without mixing.

Here's your

"TOUCH

HE HAS THE "TOUCH OF GOLD." He is operating a Norton 10" Type CTU-HD semiautomatic grinding machine which frees him almost entirely for loading and unloading the work of one or more machines. This machine has automatic feeding and control, it has high output and great versatility. The operator can reach all controls from one position.

OF GOLD"

for heavy-duty cylindrical grinding

Norton 10" Type CTU-HD brings new production speed to wide wheel plunge grinding jobs

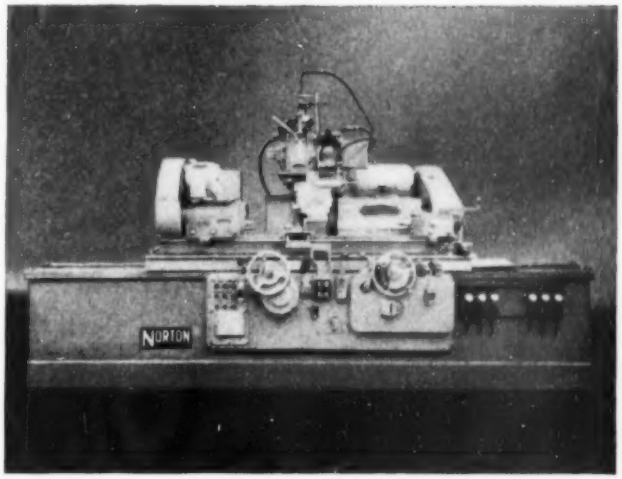
This is heavy duty cylindrical grinding at its modern best. This new 10" CTU-HD grinding machine adds value and usefulness to every piece of work it grinds. It gives you the "Touch of Gold" by increasing production rate and profit margin, too.

Norton 10" Type CTU-HD (and its companion 14" Type LCTU-HD for increased swing) employ very wide wheels or multiple wheels widely spaced for plunge cut operations. For such work as grinding crankshaft bearings, wheels of large diameter permit a maximum amount of wheel wear before interference with parts of the work.

In addition to the larger wheel capacity, these machines incorporate the many time-tested features of Norton standard Type CTU grinding machines . . . simplified operation . . . simplified maintenance . . . automatic or manual control of work rotation and coolant flow. They are built for work lengths between 18" and 72".

Reliable, rugged qualities are built-in. Wheel feed is by a precise revolving feed screw mechanism having the sensitive touch click-count index, by which settings for .0001"—in work diameter reduction are made instantly and without need for visual check.

More detailed information is given in Norton Supplement 807 and Catalog No. 1787-2. Only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. Take advantage of this experience — discuss your present grinding problems or your post-emergency production. Write NORTON COMPANY, Machine Division, Worcester 6, Mass.



LOOKING AT THE MOST MODERN grinding machine of its type. A single operating lever puts the grinding cycle control within operator's easy reach at a convenient height. Special job-easing equipment such as the Automatic Wheel Guard Type Truing Device, the Endwise Work Locator, and the multi-diameter set of grinding gages as shown, is available as extra.

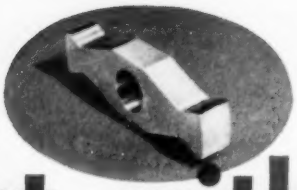
***To Economize, Modernize With* NEW**

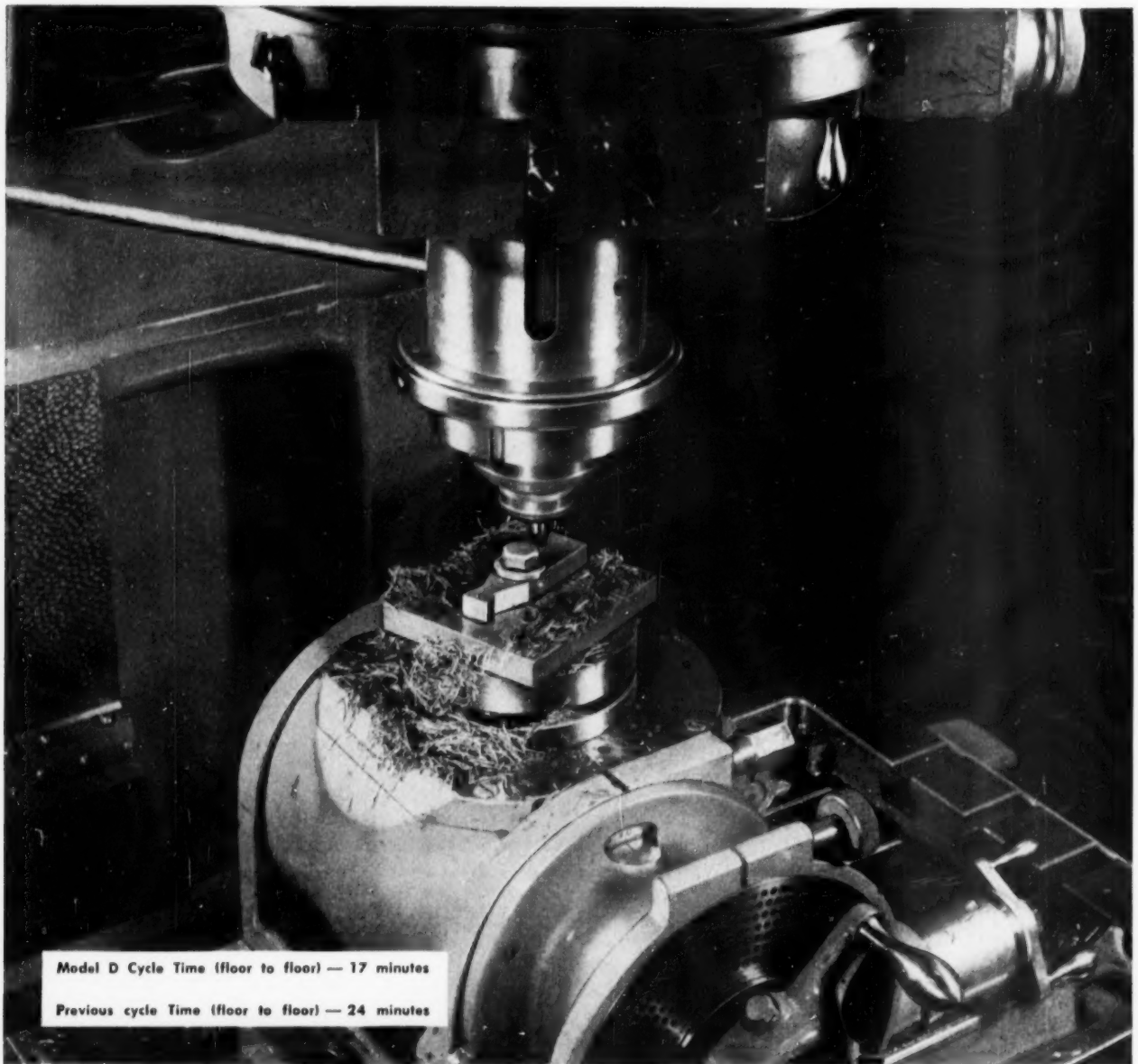
NORTON

GRINDERS *and* LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5

This part  is the blueprint, with a



PRODUCTION DATA

Part	Control Valve Lever	**Spindle Speed**	530 rpm
Material	SAE 1020	**Lot Size**	50 pieces
Cutter	½ in. — 2-lip HSS End Mill	**Machine**	Model D

finish-milled direct from single setup, in 17 min.!

Kearney & Trecker Model 2D Rotary Head Milling Machine saves six hours on 50 piece run

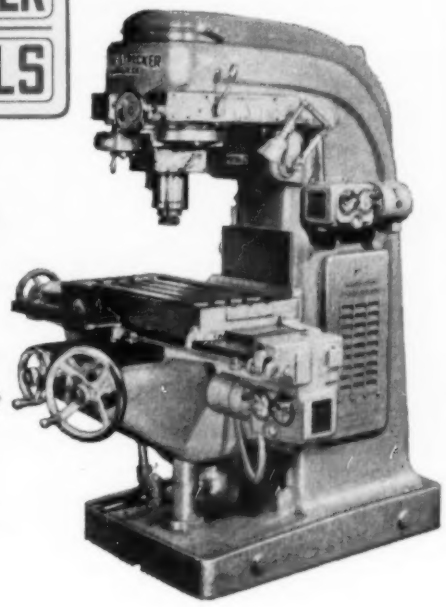
HERE is another example of the tremendous time and tooling savings possible with the rotary head milling method.

This manufacturer used to complete a control lever every 24 minutes. Now the same work is completed in only 17 minutes. . . . and no multiple setups or expensive form cutters are necessary. The blueprint is the only guide the operator needs — the machine's precise mechanical control of the cutter's angular and radial movements does the rest.

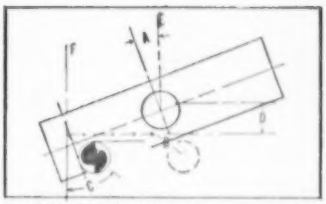
Here's the Rotary Head Milling Machine Production Idea Booklet. It contains several examples of how this method has been found exceptionally efficient in solving production, die, forging and metal pattern milling problems. It's yours for the asking.

Address requests to Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

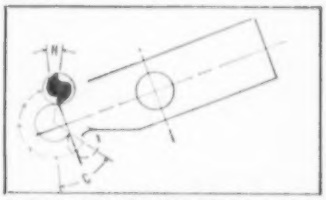
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS



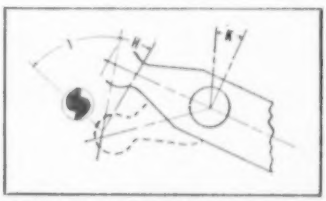
THIS IS THE MACHINE that will handle your light production milling faster, easier and at tremendous savings over any other method. If you have any production problems in plastic molds, die-casting, forging and stamping dies, or selected production milling operations — it will pay you to investigate the Model 2D Rotary Head Milling Machine.



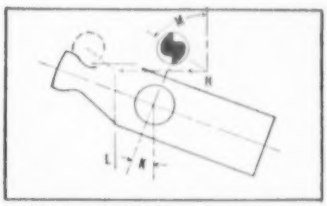
1. MILL 20° ANGLE. Index piece to angle (A), offset spindle slide to radius (B), set rotary head to angle (C), saddle to (D). Feed table (E) to (F).



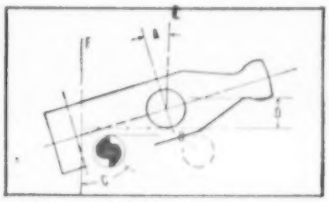
2. MILL .642/.645 DIAMETER. Rotate head angle (C) to angle (H).



3. MILL 1⅝ IN. RADIUS. Rotate head from angle (H) to angle (J), index dividing head from angle (A) (Oper. 1) to angle (K).

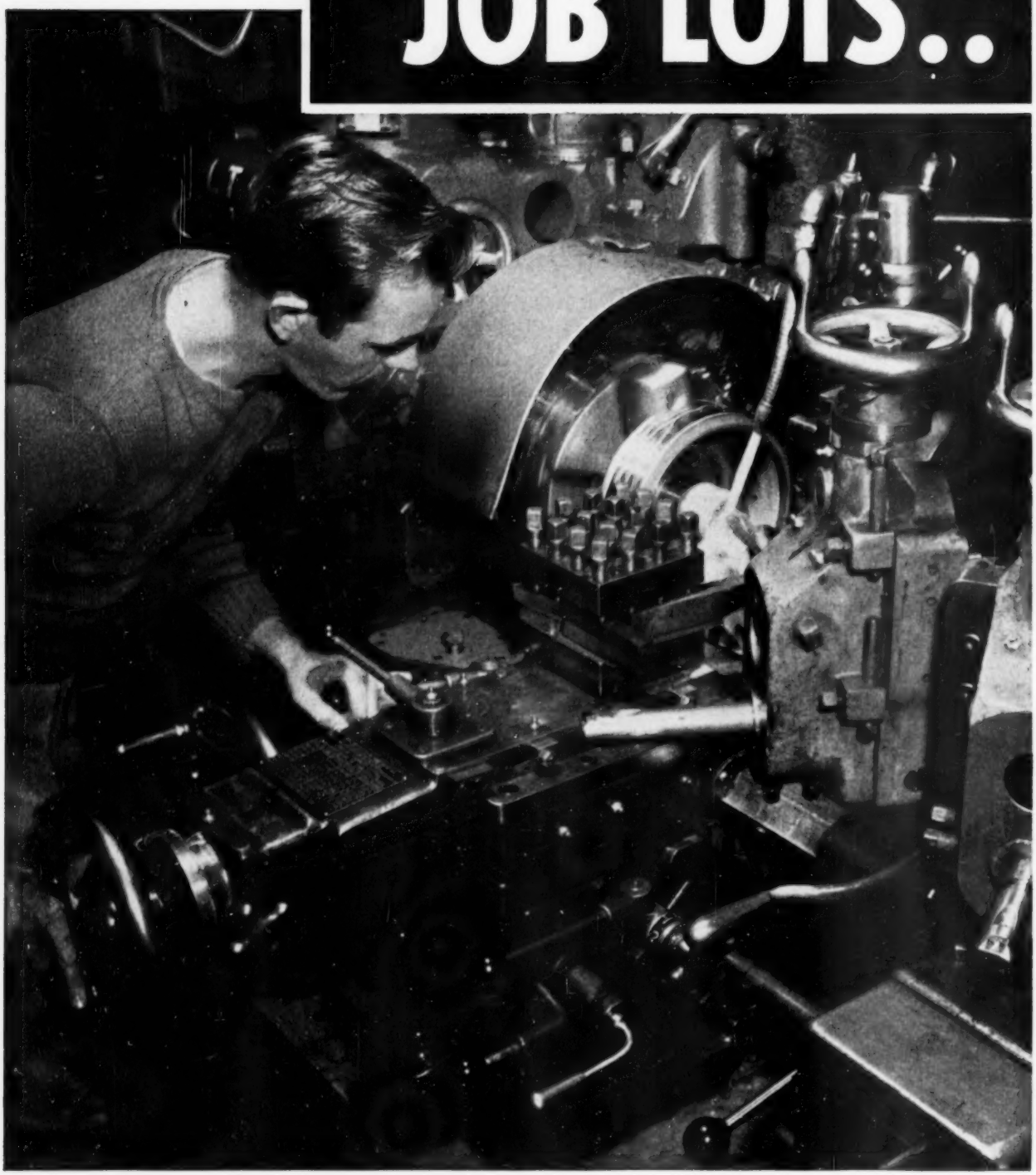


4. MILL 20° ANGLE. With piece at (K), move center of head to (L), rotate head to (M). Feed table (L) to (N).



5. MILL SAME FORM ON OPPOSITE END. Repeat operations 1 through 4 by indexing the workpiece to angle (A-Oper. 1).

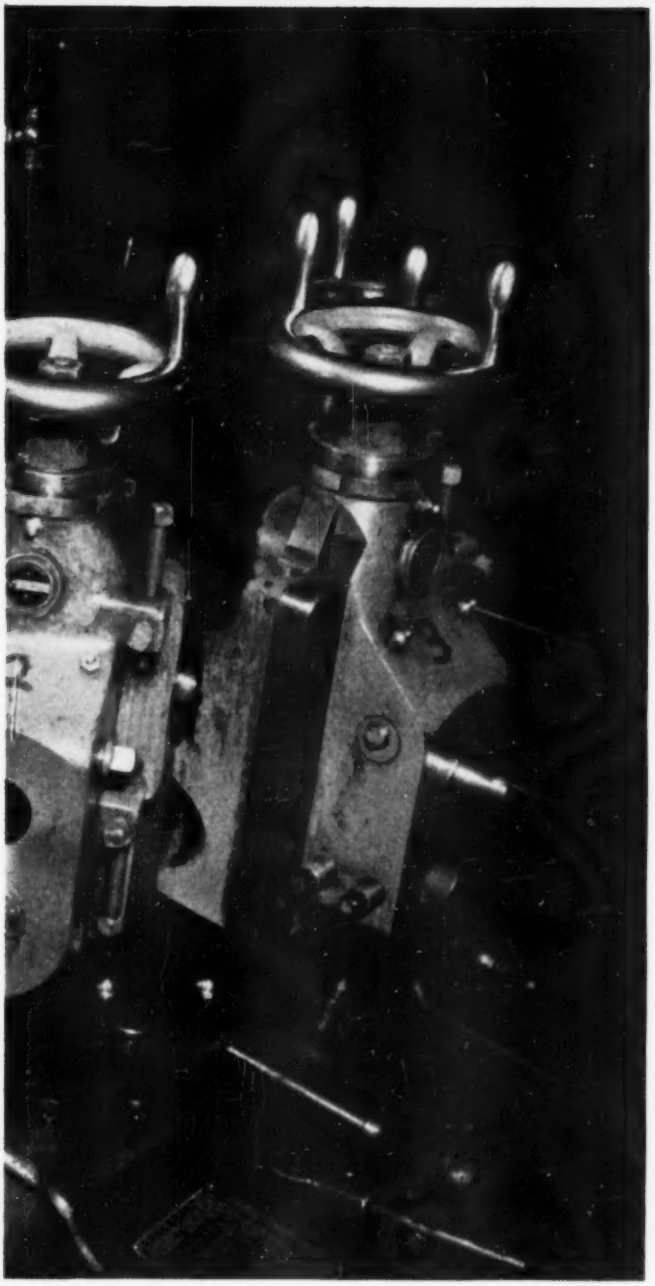
JOB LOTS..



A steel forged drive gear for Diesel locomotives being machined on a Warner & Swasey 1-A Turret Lathe. Limit: .0005" on O. D. of hub. Pieces in lot: 20. Repair parts for locomotives are also made on this machine.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

.LARGE OR SMALL



No Problem at American Locomotive

WHEN YOU MUST MACHINE a wide variety of jobs in various lot sizes—sometimes even single pieces—you must use turret lathes on which jobs can be set up quickly, changed with little downtime. American Locomotive has found they can handle these jobs *profitably* on Warner & Swasey Turret Lathes set up with Standard Universal Tooling.

At the Diesel Engine Division in Auburn, New York, six different model Warner & Swaseys are used on a variety of jobs ranging from lots of 6 to 500 pieces. Repair parts are also handled on these machines. These turret lathes turn everything from gray iron castings to tough alloy steels and hold limits of .0005".

American Locomotive experience proves jobs can be switched quickly on these Warner & Swaseys. Warner & Swasey power handles heavy multiple cuts. Warner & Swasey speed permits most efficient use of carbide tools. Rigid Warner & Swasey design guarantees lasting accuracy.

Warner & Swasey Turret Lathes have proved themselves profitable in handling precision jobs of many different kinds in thousands of plants—on job lots, large or small. So before you invest in any machine tools, call in your nearest Warner & Swasey Field Representative and find how Warner & Swasey can improve production and build profits for you.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

NATCO HOLEWAY Automatic Processing Machine

with *Mobile Hydraulic Power Units**

"And of course they comply 100% to J.I.C. Standards"

* NATCO mobile hydraulic power units mean (1) speedy replacement, keeping down time to minimum (2) accessibility for adjustment or repair (3) lower maintenance cost (4) continuous production

Completes 102 operations automatically on each engine block

production-100 parts per hour

OPERATION DETAIL AS FOLLOWS:

Station 1—Load

Station 2—L. H. Head; Combination core drill and counterbore cam hole in rear wall
R. H. Head; Core Drill cam hole in front wall

Station 3—L. H. Head; Drill 6 holes
R. H. Head; Drill 6 holes

Station 4—Idle

Station 5—Idle

Station 6—L. H. Head; Drill 9 holes
R. H. Head; Drill 16 holes

Station 7—L. H. Head; Drill 2 holes
R. H. Head; Drill 2 holes

Station 8—Idle

Station 9—L. H. Head; Drill 2 holes, Chamfer 7 holes
R. H. Head; Chamfer 16 holes

Station 10—L. H. Head; Drill 2 holes
R. H. Head; Drill 2 holes, Chamfer 4 holes

Station 11—Idle

Station 12—L. H. Head; Drill 2 holes, Chamfer 3 holes
R. H. Head; Drill 2 holes

Station 13—L. H. Head; Drill 2 holes
R. H. Head; Drill 2 holes

Station 14—Idle

Station 15—L. H. Head; Combination ream and chamfer 2 holes, Ream 2 holes, Semi-finish ream 2 holes
R. H. Head; Drill 2 holes

Station 16—L. H. Head; Combination ream and counterbore 1 hole
R. H. Head; Trepan 2 holes, Ream 2 holes

Station 17—Remove part

Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
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If YOU've got it to grind...

CARBO

TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York

WE've got it to grind with!

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

For instance, take portable grinding. You can choose from at least 9 different methods of grinding with portable equipment. You're looking for the best, most economical method for your needs. How can you be *sure?* By asking CARBORUNDUM...for CARBORUNDUM alone has a complete, branded line of grinding wheels *and* abrasive belts *and* tumbling and polishing grains...and only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or perhaps you manufacture kitchen knives. You might use grinding wheels or abrasive belts or *both* to grind the edges and bolsters...finish the handles...or sharpen the blades. You could use abrasive grain on set-up wheels, or abrasive belts, to finish and polish. CARBORUNDUM alone can give you *one-source control* of abrasive quality, on every type of abrasive you use...quality that's constant, identical, dependable—thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery...and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

Ready now—your free copy of the new big COATED ABRASIVE SELECTOR catalog...containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today.

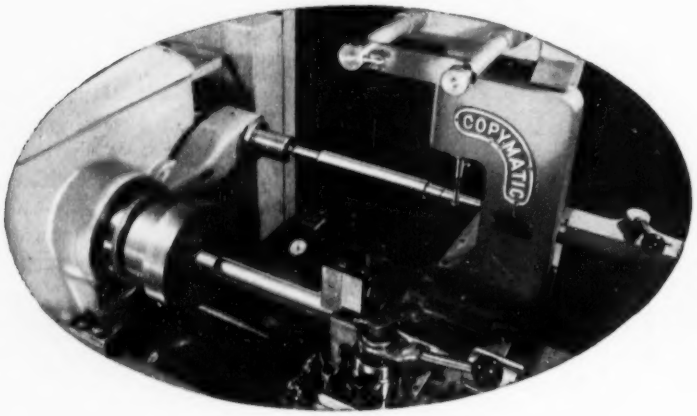
RUNDUM

MARK

...the ONLY source for EVERY abrasive product you need

full course or short orders

WITH A **LODGE & SHIPLEY COPYMATIC**



What's on your lathe work "menu"?

"Short order" limited runs, 5 or 25 pieces?

"Full course" turning production, 500 or more pieces?

Or both? Here's the lathe that satisfies any production "appetite."

For example, Leland Electric Co., Division of American Machine & Foundry Co., finds the COPYMATIC "the answer to short order lathe turning . . . saves 8 hours per day . . . 1 man's salary per year!" On large runs, users report production increases up to 536%.

Reports on jobs comparable to yours are available in case histories together with NEW descriptive Bulletin No. 675. Write for your copies.

THE Lodge & Shipley COMPANY

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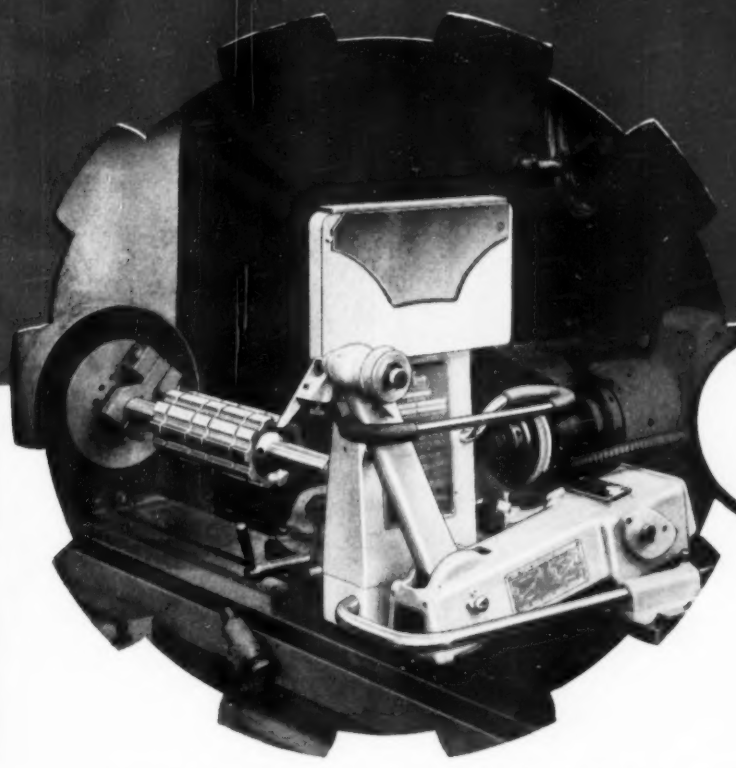
NOW GRIND STRAIGHT and INVOLUTE SPLINES

Easily . . . Accurately

with



Diaform WHEEL FORMING ATTACHMENT

Applied to CONVENTIONAL SPLINE SHAFT GRINDING MACHINES

The Pratt & Whitney DIAFORM Wheel Forming Attachment operates on the pantograph principle and provides a size reduction ratio of 10 to 1 between the template and the grinding wheel. This means a correspondingly favorable ratio in the reduction of errors in form grinding spline shafts, punches, dies, forming tools and other similar work pieces. Newly adapted to use with conventional spline shaft grinding machines, the DIAFORM now — for the first time — makes possible fast, easy, profitable production in accordance with American Standard, B5.15 on Involute Splines approved and published in 1950.

A lightweight, portable instrument, the DIAFORM does not interfere with normal grinding operations when left on the machine. Forming and re-truing wheels is accomplished by lightly traversing the tracer over an inexpensive template; even the most complicated forms are easily completed in a much shorter time than by any other method. Like all Pratt & Whitney products, the DIAFORM is manufactured and inspected to conform with rigidly high standards of quality and accuracy.

SEND NOW FOR COMPLETE INFORMATION

Learn how DIAFORMING can bring new standards of accuracy . . . and new savings . . . to your grinding operations. Just fill in and mail the attached coupon or write on your Company letterhead.

DO IT NOW

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

BRANCHES IN PRINCIPAL CITIES

First Choice for Accuracy

MACHINE TOOLS • CUTTING TOOLS • GAGES

PRATT & WHITNEY — Div. Niles-Bement-Pond Co.
11 Charter Oak Blvd., West Hartford 1, Conn.

Gentlemen: Please mail my copy of:

☐ BULLETIN NO. 543 for WHEELS UP TO 1" WIDTH — 10" DIAMETER
☐ BULLETIN NO. 548 for WHEELS UP TO 3" WIDTH — 20" DIAMETER

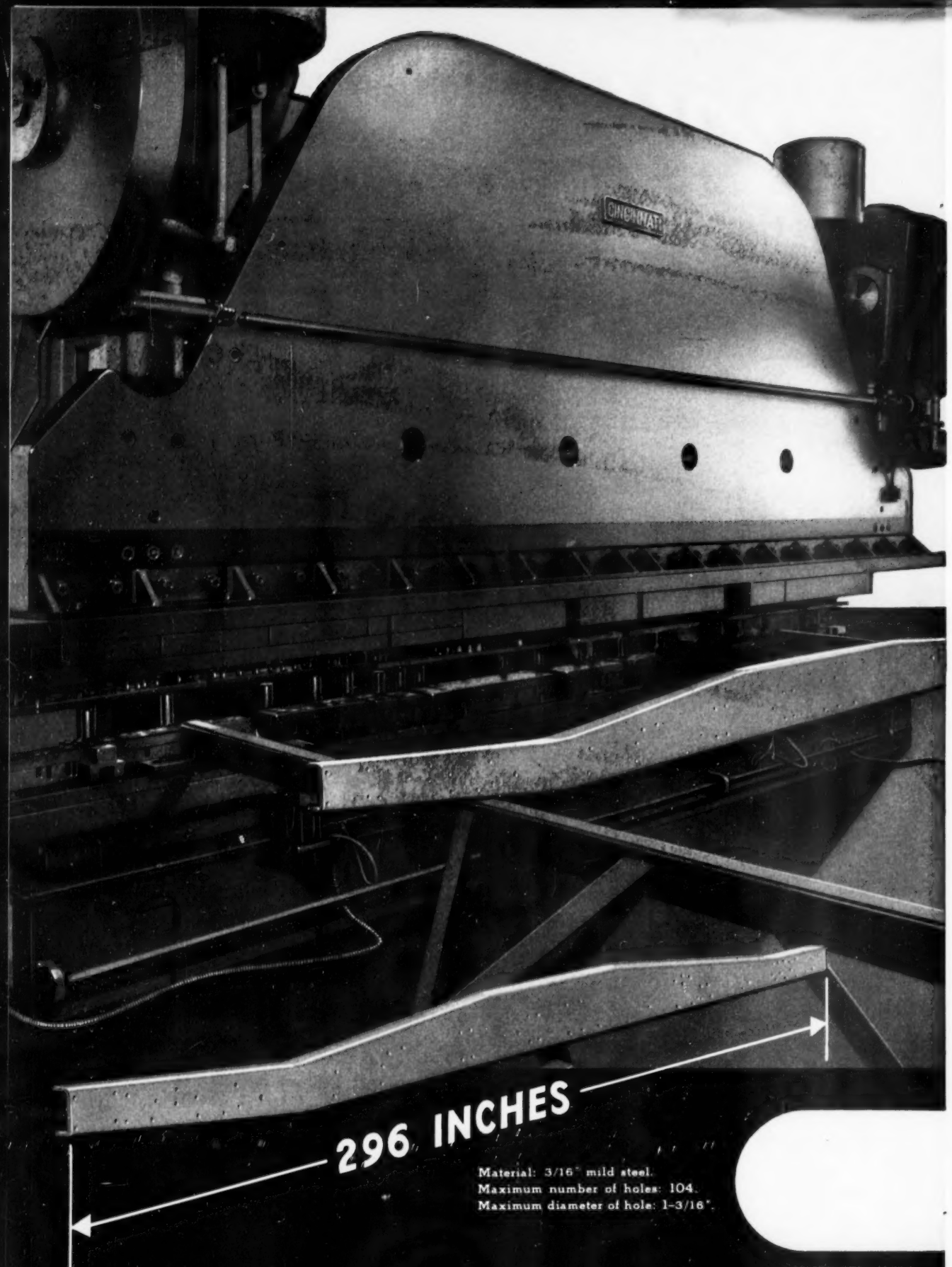
NAME _____

POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE ____ STATE _____



Material: 3/16" mild steel.
Maximum number of holes: 104.
Maximum diameter of hole: 1-3/16".

PUNCHING

104 holes every 10 seconds *accurately*

The multiple punching of these holes must be very rapid, and their location as well as spacing must be held accurately.

The assembly of these 24′ trailer frames is smooth and economical with no costly hand fitting.

With this punching equipment, position, size and spacing of holes may be changed quickly and at low cost.

The Brake can perform many other operations as desired . . . converting from one operation to another quickly and at low cost.

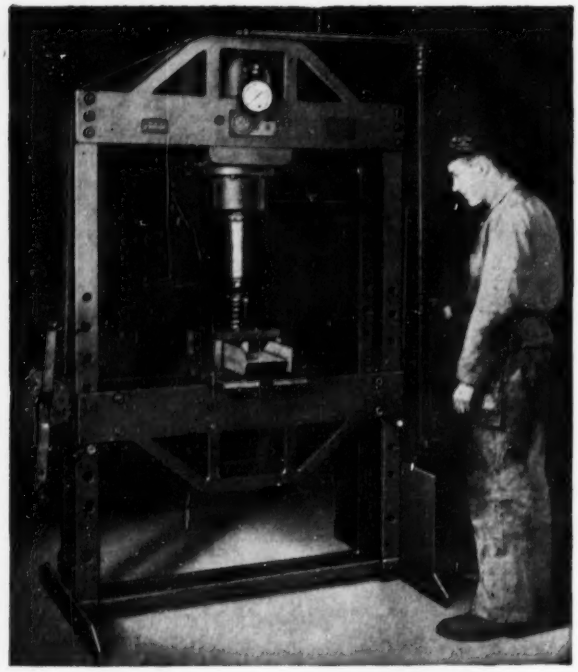
Write for the New comprehensive Catalog B-4.

Photo—Courtesy Youngstown Steel Car Corporation.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI



KRW HYDRAULIC PRESS DOES 4 VITAL JOBS ON POLE-SETTING DERRICKS

BATAVIA METAL CORP. bought a K. R. Wilson 75 ton motor-driven Hydraulic Press two years ago to perform a few routine operations on their pole-setting derricks (derrick shown on telephone truck below). But they soon found that the amazing versatility of the press—the ease and speed with which it can be converted from one set-up to another, makes it a natural for all kinds of trouble shooting. Below are just a few of the jobs their KRW press does.

1. SETTING RIVETS in side legs and front braces of pole-setting derricks. Thanks to their KRW press, Batavia Metal has eliminated loosening of rivets and the resulting loss of valuable production time.

2. COSTS CUT 33⅓% The center hole on derrick foot plates must be 1½" in diameter, flanked by two 11/16" holes. Originally the company drilled three 11/16" holes on a small drill press, then moved the plates to the machine shop where the center eye-bolt hole was reamed out to 1½" diameter. Use of a simple die plus the KRW press produces all three holes in one stroke and eliminates the drilling and reaming operations, cutting costs by more than ⅓.

3. FORMING BRACKET U'S for derrick mountings on front of trucks and riveting the lower sections of front mountings are two more jobs done quickly, accurately and efficiently on the KRW Hydraulic Press.

4. FORMING BASES for rachet jacks and restoring proper contour to various castings which sometimes warp as they cool are also regular assignments for this KRW press. Company officials tell us that their KRW Hydraulic press is in use the greater part of every working day!

Any pressing problems in your plant? Check with K. R. Wilson for the right press to do the job. KRW Hydraulic Presses come in one, two and three cylinder models; 25 to 150 ton capacities; hand operated, air operated or motor driven. For facts and prices contact your machinery dealer or write, wire or phone Dep't. 11.

***IMMEDIATE DELIVERY** on type of press shown above up to 75 ton capacity, hand, air or motor driven.*

K. R. WILSON

215 MAIN STREET BUFFALO 3, N. Y.

DESIGNERS AND BUILDERS OF HYDRAULIC PRESSES TO SOLVE ANY METALWORKING PROBLEMS

Production Pointers from GISHOLT

GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your metal work.

GOOD TWIST FOR ROTOR COUPLINGS

Centering and Holding Simplified by Splined I.D.

This user solved several problems at once . . . by the application of a splined arbor to chuck these steel shaft couplings for turbine rotors. This method provides the firm holding needed for a heavy forming cut, taper boring and other machining. The machine is a Gisholt No. 4 Ram Type Turret Lathe.

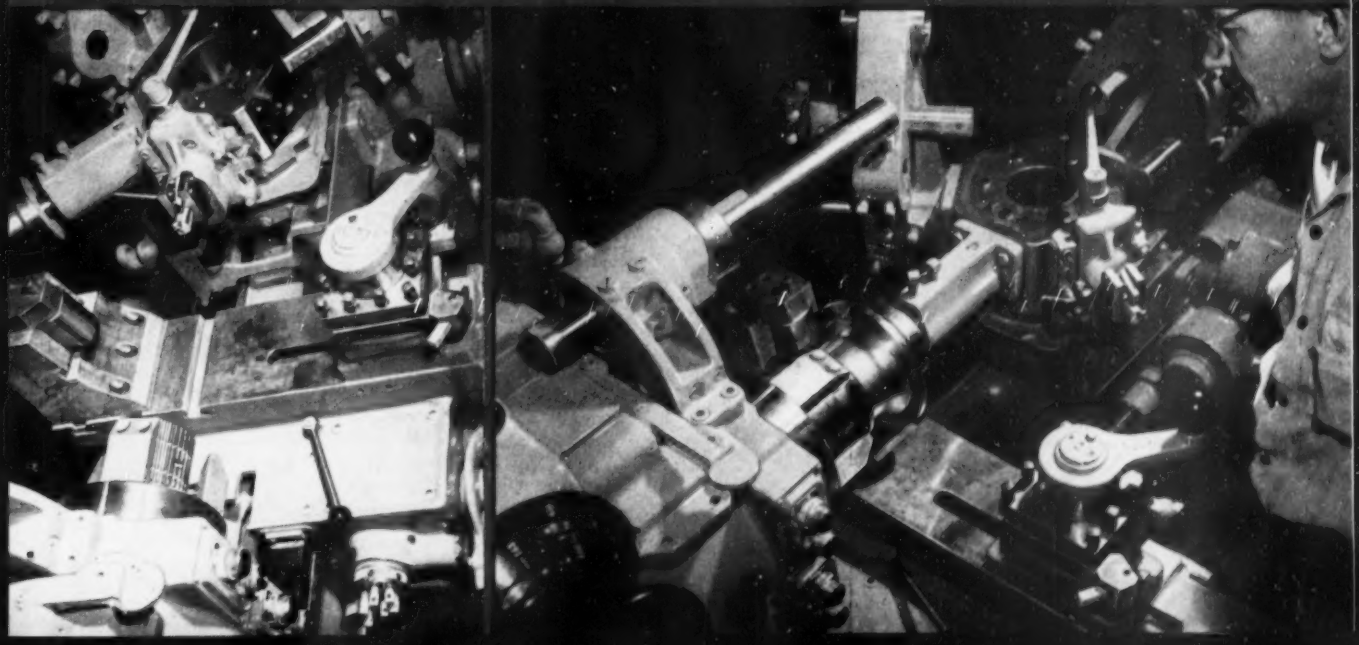
The workpiece is slipped on the arbor against three stops. The splined arbor has a center section that rotates slightly, locking the two splined surfaces snugly to eliminate all play.

The heavy forming cut is done with a dovetail forming tool on the rear of the cross slide. During this cut the workpiece is supported with a live center mounted on the hexagon turret.

The taper attachment is placed on the front of the cross slide carriage and bores the conical inside surface with the cutter in the square turret. The balance of machining is conventional and is done by tools on the hexagon and square turrets.

On this tough steel workpiece, the tolerances are close, a lot of chips are made . . . yet the No. 4 Ram Type Lathe does the job in only 10.7 minutes, f.t.f.

Splined arbor with rotating locking dogs (rear). Setup for machining rotor shaft couplings. Here, the forming cut is being made.



GISHOLT

TIME-SAVING IDEAS

SMART CHUCKING AND TOOLING COMBINE TO CUT COSTS

DANLY Handles 32 Different Parts on ONE Simplimatic

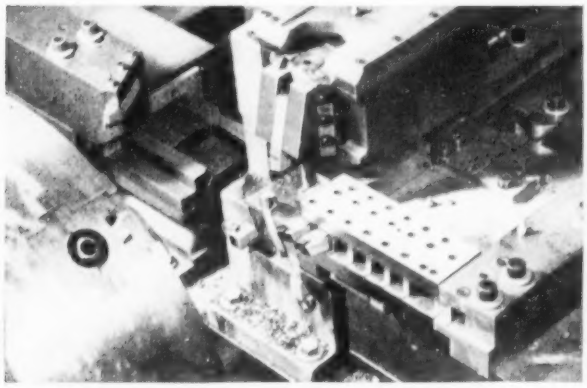
High production of 32 different parts on *one* machine is a neat trick to cut costs—if you can do it . . . particularly when you have square and rectangular shapes to chuck. But Danly Machine Specialties, Inc., largest producer of die maker supplies, is doing it.

The job is machining punch holders . . . and the machine is a 3D Simplimatic Automatic Lathe. The problem of chucking the 32 different sizes was solved by a duplex chuck having two pairs of self-centering jaws which work independently of each other.

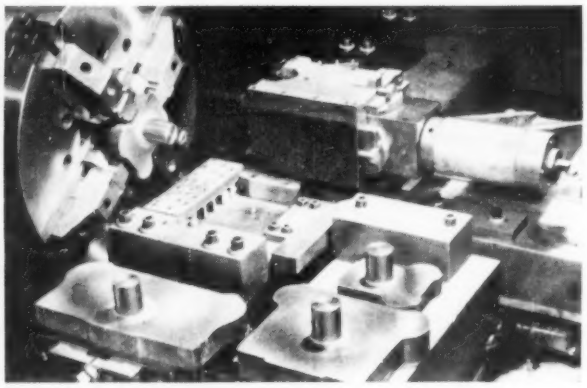
An important aid to production is the front slide with provision for adding tools to accommodate tool travel on the various size workpieces. All 32 types of punch holders are handled simply by inserting or removing tools as necessary.

For the finishing operation, the Simplimatic has a variable speed motor. As the rear slide tool approaches the hub and the diameter diminishes, spindle speed increases. Thus, cutting speed is essentially the same for the entire face of the workpiece.

In this interesting setup, 32 different size parts are handled simply by repositioning chuck jaws and adding tools to the front slide.



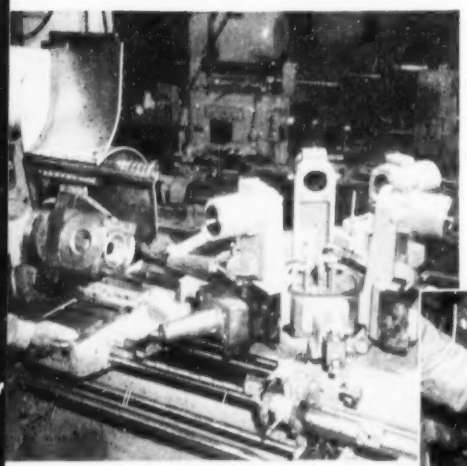
Jaws of chuck operate in pairs to center parts. Note typical workpieces in foreground.



Tooling for machining steel punch holders. Time for workpiece with this setup is only 2.33 minutes.

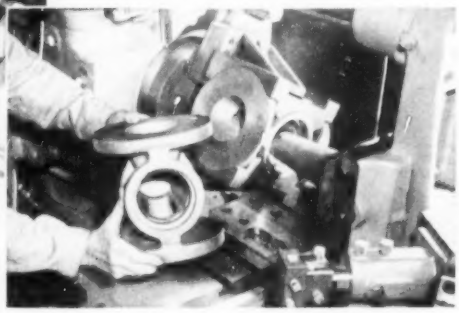
VALVE BODY PRODUCTION . . . *ON THE DOUBLE*

Features Single Point Tools Instead of Reamer



▲ 2F Fastermatic tooled to machine variety of valve bodies.

Operator holding typical valve body. Note cam-guided boring tool, slide-mounted, on hexagon turret. ▶



Note how this user machines both cast iron and steel plug valves, in a variety of sizes, with this Gisholt 2F Fastermatic Automatic Turret Lathe. The first turret station has a loading arbor to carry the workpiece into proper position for chucking.

Five or six hexagon turret stations are used, depending on the kind of valve body being machined. The tapered seat for the plug is rough and finish bored with single, horizontal slide tools mounted on the hexagon turret. These are guided by an angular cam on the cross slide and held tightly against the cam by sustained air pressure.

In addition to the taper bore for the valve plug, there is boring, facing, and on some workpieces, grooving. Floor-to-floor time for the 2″ valve body shown is 11.5 minutes. A single operator easily handles two machines.

The internal taper diameters of these plug valves are bored with repetitive accuracy and finish by cam-controlled single point tools, rather than the usual reamers.

GISHOLT

TIME-SAVING IDEAS

FOUR OPERATIONS ON TWO PIECES WITH SIMPLE CHANGEOVER

Shows Versatility and Speed of No. 12 Hydraulic Lathe

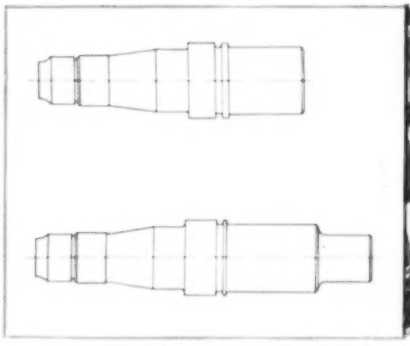
Two different workpieces, each requiring machining on both ends, are handled here with fast, easy changeover. The parts are suspension spindles of nearly equal diameter, but of different lengths. The Gisholt No. 12 Hydraulic Automatic Lathe is the machine handling both.

The parts are held between centers and rotated by an automatic workdriver. Variation in the lengths of the two workpieces is provided for by the use of different tailstock centers. By this method the rear independent slide always remains in the same position—minimizing changeover time. Extra dwell for the rear independent slide tools is obtained through an adjustable stop-block. This is screw mounted on the slide and actuates a switch that starts a timer. The timer operates through the main control valve, returning the slide at the end of the timer cycle.

All turning operations on either end of both workpieces are done from the front carriage. Tools on the rear independent slide handle all grooving, facing and chamfering. Time for the first operation on both spindles is 1.60 minutes. For the second operation, floor-to-floor time is 2.00 minutes for both workpieces.

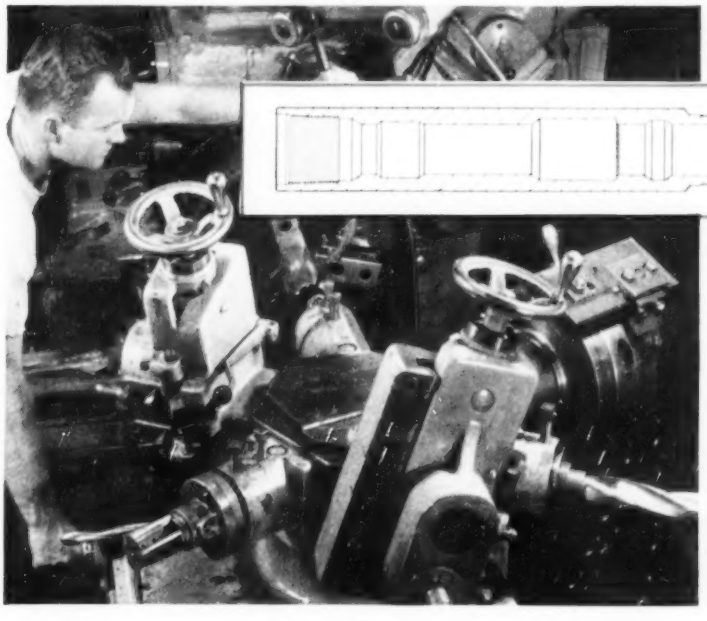
Here's an example of fast, automatic production, with simple changeover on two different parts of varying lengths.

First operation setup for small spindle. Second operation has similar machining on both size spindles.



SIMPLE SWITCH BOOSTS PRODUCTION 50%

Turret Lathe Brings More Tools to Bear on Work



Setup that increased output 50%

One tool at a time is fine . . . up to a point. When you begin to get into a variety of surfaces, such as here, it's time to change.

That's exactly what Otis Engineering Corporation, Dallas, Texas, did in the machining of these stainless steel landing nipples used in deep oil-well work. By taking the job off an old lathe and putting it on a modern Gisholt 2L Saddle Type Lathe with multiple tooling, they were able to make an immediate production increase of 50%.

Everybody is happy about it: The firm, because the machine gives a full 95 hours per week of *lower-cost* production — and the operator, Richard N. Crawford, who says, "This is one of the best turret lathes of any type I've ever operated."

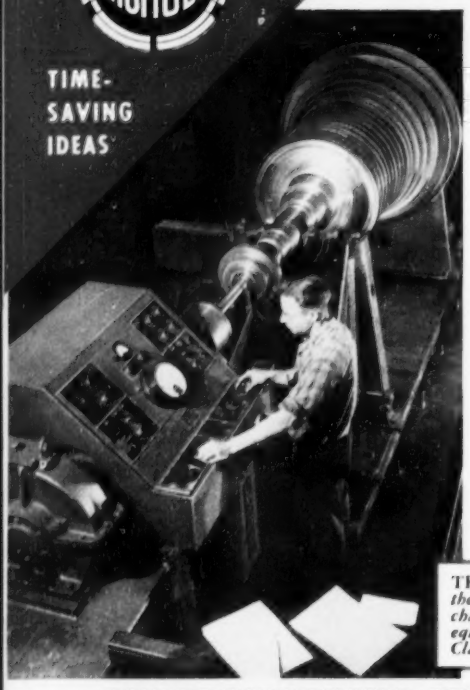
With all stations of the hexagon turret working, this two-operation job is completed 50% faster than by old method.

GISHOLT

TIME-SAVING IDEAS

SOLVED: *A WEIGHTY BALANCING PROBLEM*

5-Ton Turbine Rotors Corrected to Accuracy of 2 Ounce-Inches



De Laval Steam Turbine Company, Trenton, N. J., had a three-fold problem in balancing these large marine turbine rotors:

1. Accurate balancing
2. Correction at a rapid rate
3. Prevent scoring of journals

By dropping an older method and doing the job on a Gisholt DYNETRIC Balancer, De Laval answered all three requirements with one machine. The 16-stage rotors weigh 10,000 lbs. and measure 95" in length and 70" in diameter.

The balancing and correction functions are tied together. The rotors are balanced to an accuracy of 2 ounce-inches by making correction on two balance rings: On one, excess metal is ground off the heavy side. On the other, where it is not possible to remove material, correction is made by adding plugs of predetermined weight to tapped holes.

In the former balancing method, journals were scored as a result of being carried on rollers. This made it necessary to refinish the journals after balancing. The Gisholt Balancer ended this trouble because the workpiece is properly carried on half bearings.

As to the performance of the Gisholt Balancing Machine, the manufacturer reports, "This Gisholt Balancer replaces one of another type. We now have a safer and faster operation to give us the accuracy we require. The half bearings in the work support have eliminated the scoring of journals."

Faster, more accurate balancing of rotors by this Gisholt DYNETRIC Balancer pays off in smooth, vibrationless operation, longer life.

DYNETRIC BALANCERS

THE GISHOLT BALANCING SCHOOL *teaches the supervisor to plan for faster setups, quicker changeover, and how to get more out of balancing equipment in every way. Write for information. Classes now in session.*

SUPERFINISHING IMPROVES QUALITY OF TRANSMISSION PARTS

Faster, Less Costly Than Former Process

How to achieve fine finish on these high-quality automatic transmission parts? This manufacturer turned to Superfinish—for speed, efficiency and low cost.

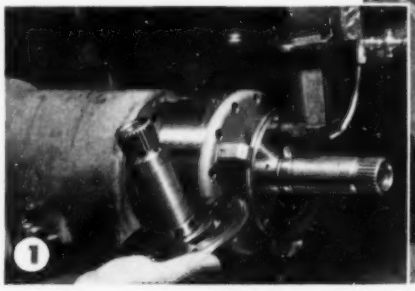
Here's how it's done:

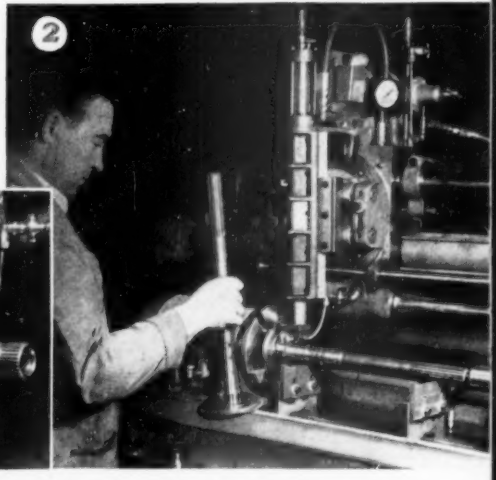
First photo shows a flanged hub in the Gisholt 52-A Superfinisher. To hold the assembly, the chuck is mounted on a special face plate. The Superfinish Stone-Carrying Quill has extra travel to provide clearance for easy loading and unloading. For Superfinishing the bearing surfaces, two speeds are used—a 10-second roughing cycle and a 15-second finishing cycle. Except for the loading and removing of parts, the machine is fully automatic with a predetermined and adjustable cycle.

To do the shafts shown in the second photo, changeover is this quick and easy: The chuck is removed, and a standard driving plate is mounted on the spindle. Loading of the longer workpiece is aided by two adjustable loading rails. The workpiece is held between a headstock dead center and a tailstock live center.

Superfinishing cycle-time is the same for both parts. Production is at the rate of 70 per hour at 80% efficiency. In both cases, bearing surfaces are Superfinished to 3 to 4 micro inches R.M.S. from a ground finish of 15 to 20 micro inches R.M.S.

In one fast, automatic operation, Superfinish rids vital bearing surfaces of smear metal, grinder flats, etc., to insure smoother, longer life. Here's not only low production cost, but also low machine investment.





THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

No. 7-853
613

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A Modern solution to an Old Problem—

A large portion of tools, dies, jigs, fixtures, molds, jig-less production and other jobs do not require the ultra-precision of a Jig Borer. The Cleereman Layout Drilling Machine has been designed specifically for the efficient handling of this particular work.

Built with many features of design similar to those used in Cleereman Jig Borers, the Layout Drilling Machine is an economical machine capable of accurately locating, drilling, boring, reaming, tapping, etc., with the utmost of operator ease, at a fast rate of production over a long period of time.

Cleereman standards of high quality and proven engineering design and material selection have been maintained in every detail.

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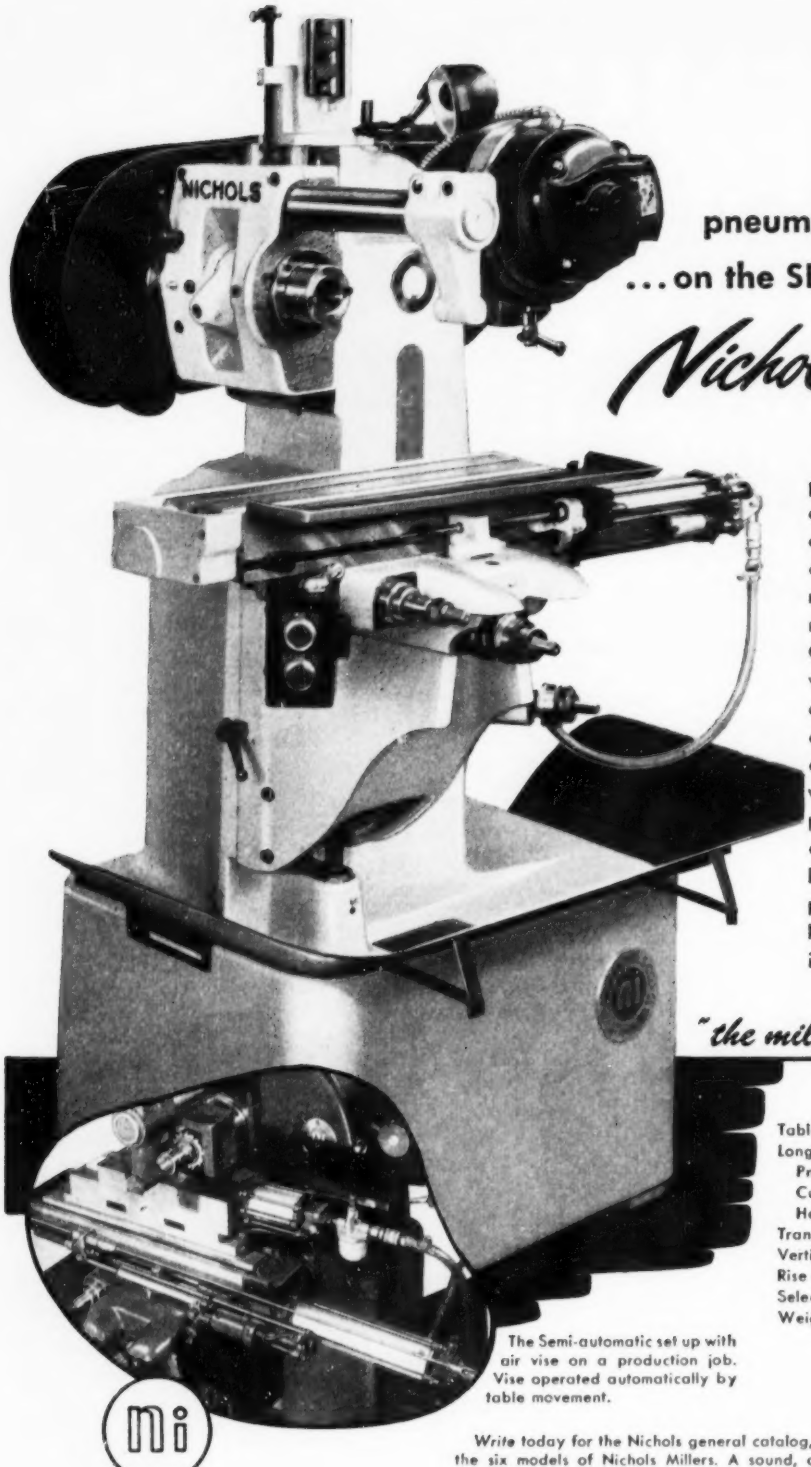

pneumatic feed — for speed ... on the SEMI-AUTOMATIC

Nichols Miller

In selecting the Nichols Miller with pneumatic table feed, you obtain precision and a high-production semi-automatic machine. The push-button controlled power feed is entirely automatic — leaves the operator free to merely load and unload the work. Often he may run two or three millers with ease. The air cylinder works against the cutter *and* the hydraulic cylinder — completely eliminating chatter and table jump. The unit provides rapid advance from loading position to the cutter, infinitely variable cutting feed, and rapid return to loading position. Also available with power vertical feed to spindle head. If you want high production to "tenths", investigate the Nichols Semi-automatic!

"the miller that uses its head!"

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Travel	
Pneumatic	9"
Cutting Stroke	5⅛"
Hand Screw (Optional)	10"
Transverse Travel	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

The Semi-automatic set up with air vise on a production job. Vise operated automatically by table movement.

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie, "the Miller that Uses its Head" is available for free showing. May we reserve it for you?

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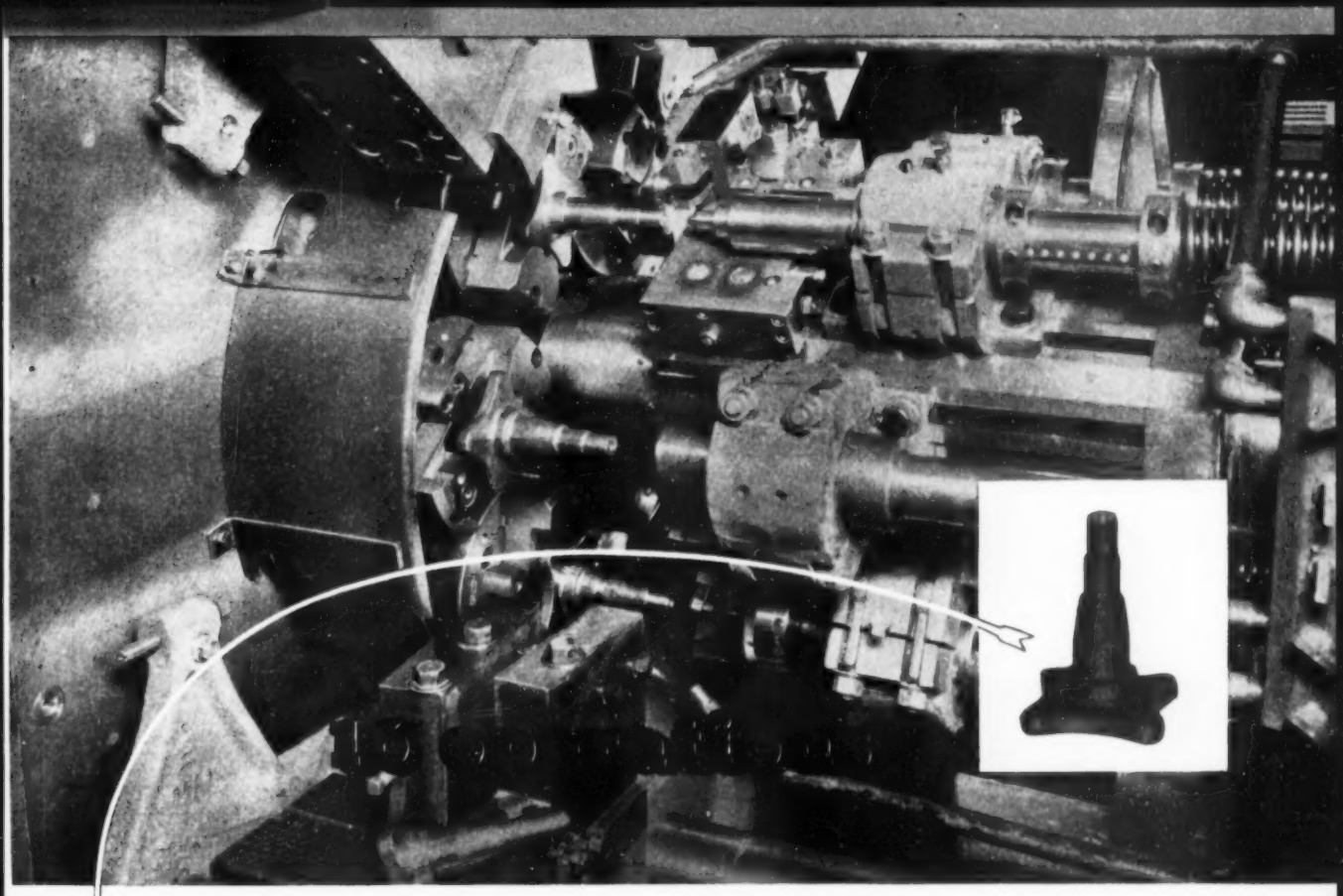

in 16 seconds on an 8-inch, 6-spindle

ACME-GRIDLEY Hydraulic Chucker

When Willys-Overland Motors, Toledo, O. changed methods to cut machining costs on larger production runs of this forged wheel spindle, they didn't buy the machine on general claims. *They bought guaranteed end results—16 operations in 16 seconds.*

They bought a carefully engineered plan of tooling for this particular job—with hydraulic centering loader, unique toolholder combinations for the 16 carbide insert tools, including 5 interrupted cuts on the flange face at 860 S.F.M.

There is another reason—Willys-Overland, like all other big automotive firms, has employed scores of Acme-Gridley Bar Automatics from 10 to 30 years. Based on this experience, it is logical that they seek our advice about advanced practices in tool engineering of Chucking Automatics.

For, no other source offers so much in design and tooling experience on bar and chucking automatics—more than 45,000 machines built.

For end results, cost savings, ask your engineers to contact ours.

JOB FACTS

PART	**Front Wheel Spindle**
SIZE	**5¼" long, 4⅜" swing**
MATERIAL	**Steel forging, AISI-C1040**
OPERATIONS	**16, all with Carbide Tools**
MACHINE TIME	**16 seconds (225 per hr.)**

The NATIONAL ACME COMPANY

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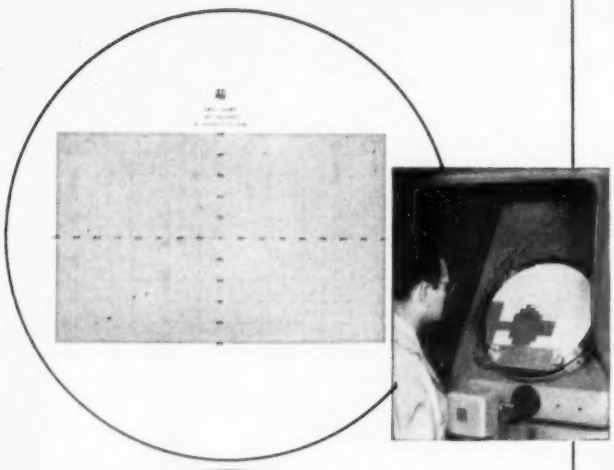

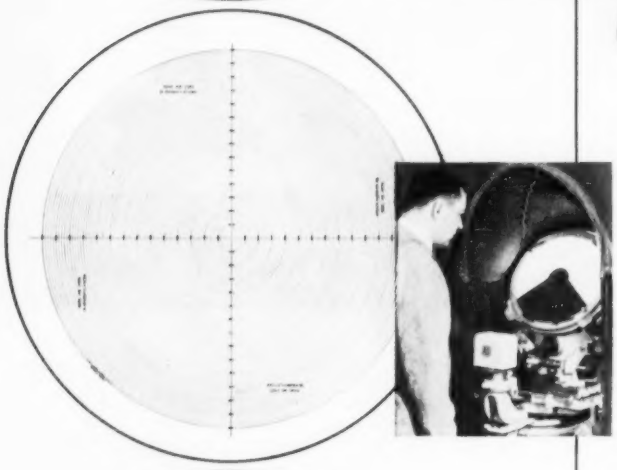

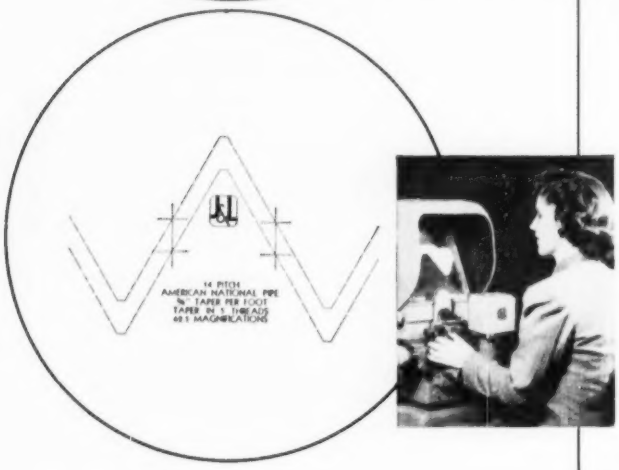

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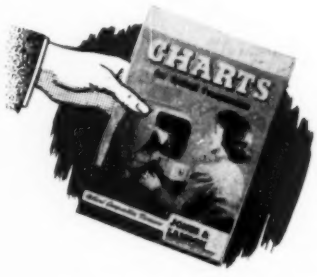

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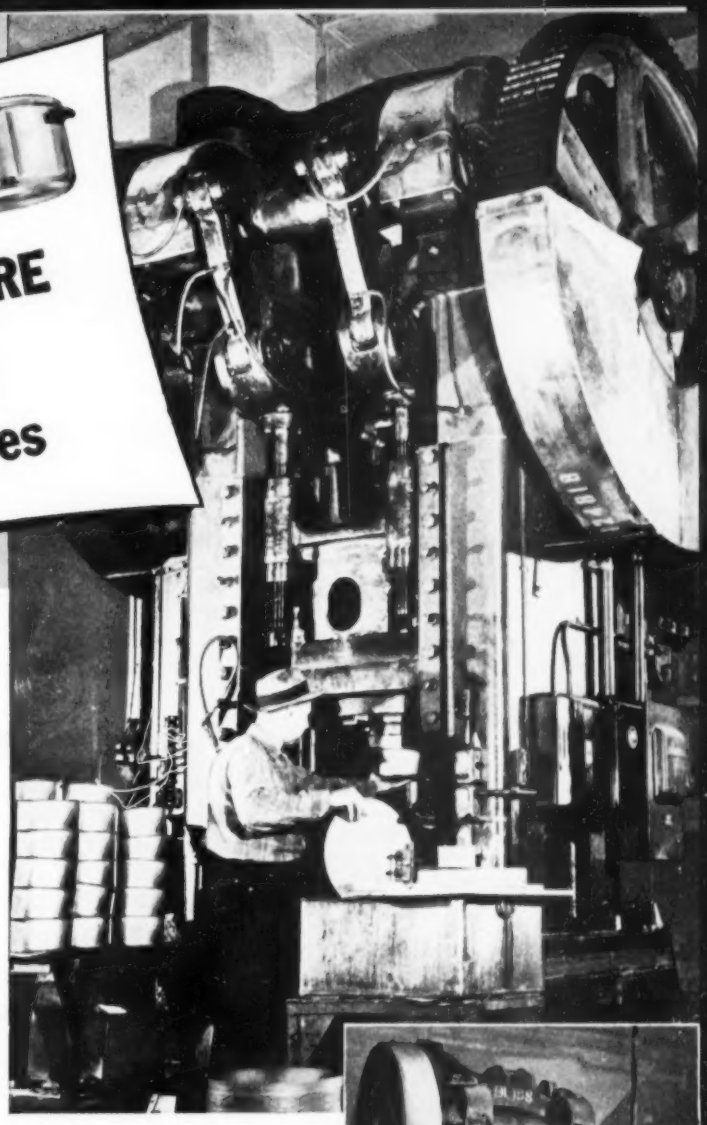
Famous FARBERWARE is 100% BLISS in drawing presses



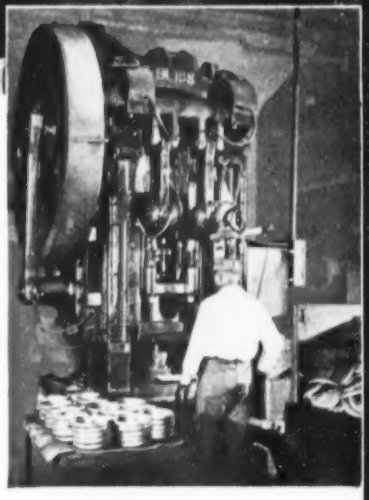
Famous Farberware begins with the finest stainless. And for dependable deep-drawing of stainless blanks, S. W. Farber, Inc. relies on Bliss toggle drawing presses—and has since 1917.

Today, the two Farberware plants are *100% Bliss* on drawing presses; *85% Bliss* on all other types.

Proven performance is the reason for this choice, of course. But here are a few of the specific operating advantages cited by H. M. Harrison, Vice President of S. W. Farber, Inc.:

1. Precision action delivers uniformly high-quality parts; keeps rejects at a minimum.
2. Bliss toggle presses are easy to set up, easy to change over; give trouble-free operation.
3. Maintenance requirements are nominal — adjustments are made quickly and easily when needed. (Floor level greasing system is a typical convenience.)

Perhaps Bliss toggle presses can solve your special deep-draw problems, too. But whatever your problems, if you're looking for high-quality, high-speed production in your press department, call a Bliss engineer. He will be glad to help you choose the *right* press for the job — mechanical or hydraulic — because Bliss makes them all.



1750 POTS IN EIGHT HOURS—that's the average production rate on this 5-S Bliss toggle. The four-quart pot is drawn 4½ inches deep in one operation from a 15-inch diameter blank of stainless.

SMOOTH BULGE on this pot cover makes it easy to clean—but calls for good press work. A rubber die is used with this 3½-B toggle press to perform this operation.

BLISS on your press is more than a name... it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

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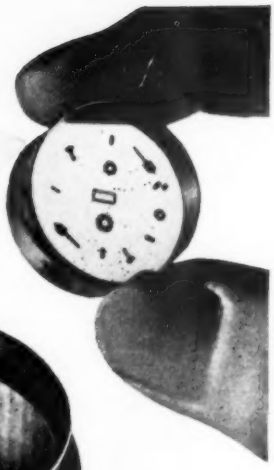
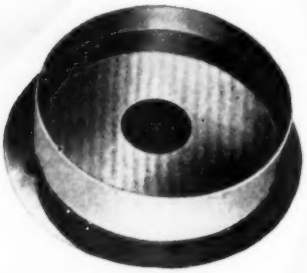
Tiny?

Yes! The No. 11 Blanchard Surface Grinder grinds these ladies' watch gears, pinions and ruby bearings flat and parallel, and to a dimension tolerance of .0002".



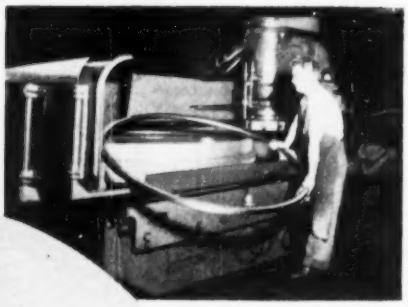
Smooth?

Of course! The Blanchard No. 11 finished this refrigerator plate, seen through an optical flat, to 3 micro inches and flat within 1 light band (.0000118").



Accurate?

Sure . . . and easy, too! This Blanchard grinds 84" forged steel rings flat within .0002", parallel to .0002", dimension tolerance of ±.0005", and with surface finish of 4 micro inches.



Tremendous?

Yes . . . but fast! This 88" diameter cast-iron plate was ground on a No. 42-72-84 Blanchard in 3½ hrs., floor to floor. ¼" of stock—1520 cu. in.—380 lbs. was removed.

If you produce flat surfaces, your best bet is Blanchard Grinders—with Blanchard Wheels!

PUT IT ON THE BLANCHARD

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE CO.

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

No. 3 in a Series

Conomatics demonstrate carbide tools

We believe you know that not every "automatic" job can be tooled successfully with 100% carbide. What we think you may not know is that the Conomatic Carbide Development program is making progress with such jobs. This relatively new Cone service is convincing to those who like to be shown that "it can be done".

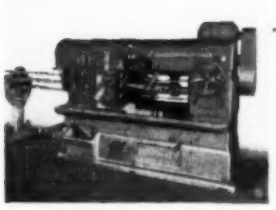
Granted that experimental runs are not production runs, it has often been proved that under actual production conditions they have developed into production runs. A number of conditions must be met in the successful use of any tooling material. Carbide is no exception. If the comparisons of 100% carbide and HSS runs indicate as much gain as per the job illustrated, the reward is worth the effort.

For full particulars please consult your Cone Representative or inquire direct.

MATERIAL—EVERDURE: (96% copper, 3% silicon, 1% manganese) Hole drilled with 17/32" drill to 1½" depth; thread rolling of ½" pipe thread.

	HSS	CARBIDE
Cycle Time	35 secs.	15 secs.
Work Spindle Speed	420 R.P.M. at 124 S.F.	850 R.P.M. at 250 S.F.
Tool Wear	2000 pcs. per grind	5000 pcs. per grind

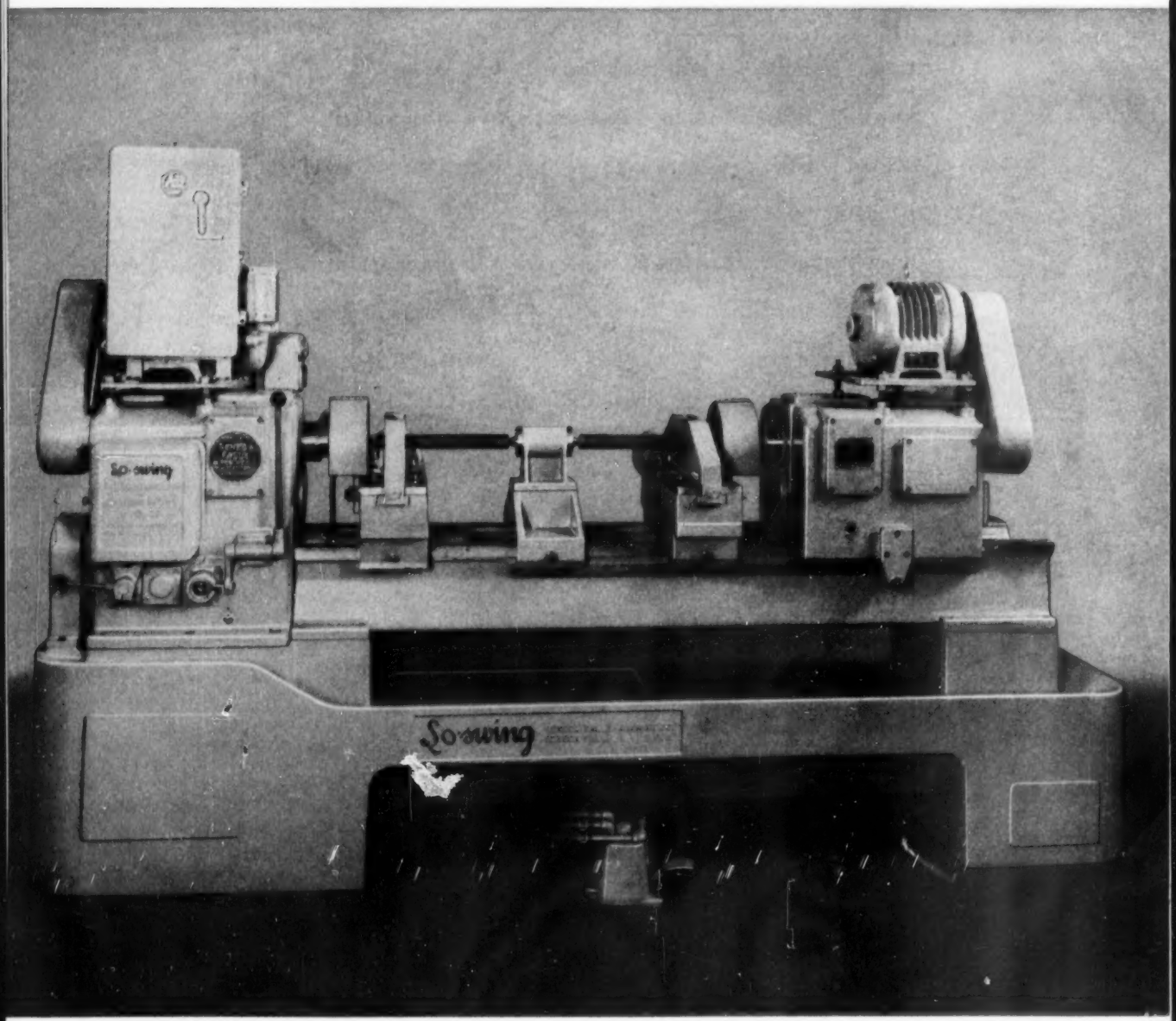
The CONOMATIC is the ONLY representative of Frame "A". The short, "weave-proof," upright members, secured between larger and heavier top bed and base, make possible the strongest type of bridged support to the tooling area and its "work and tool axis."



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

MACHINE OF

MODEL CS *Lo-swing* CENTERING MACHINE CUTS COSTS BY CENTERING TWO SHAFTS SIMULTANEOUSLY



PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

Problem: To center one end of two shafts simultaneously or during one cycle of the machine. The previous operation on the shafts consisted of cutting shafts to length and centering one end in an automatic cutting-off machine.

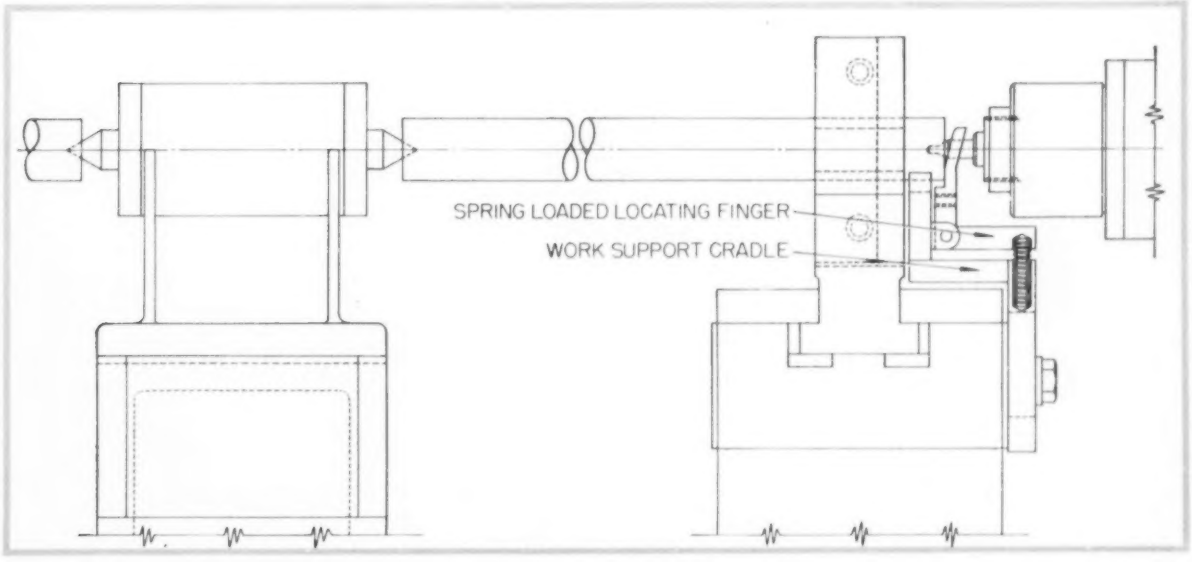
Solution: The Model CS Automatic Centering Machine selected for this job was equipped with two standard air operated vises for holding the two shafts close to the ends to be centered. A special fixture (shown between the two vises) was designed with two centers to hold and locate the two shafts on the ends previously centered.

This method of holding and locating the parts assures constant overall distance between the two centers in each part within close tolerances.

The line illustration shows the detail of the work support and spring loaded locating finger supplied with each vise. The spring loaded locating finger holds the shaft under tension on the double center fixture until the shafts are clamped tightly in the vises.

The machine is entirely automatic in operation after the shafts are clamped. The operator pushes the starting lever and the centering spindles advance in rapid traverse to the cutting position, slow down for feed, and then return in rapid traverse to starting position ready for unloading and reloading.

Seneca Falls engineers welcome inquiries involving your machining problem.

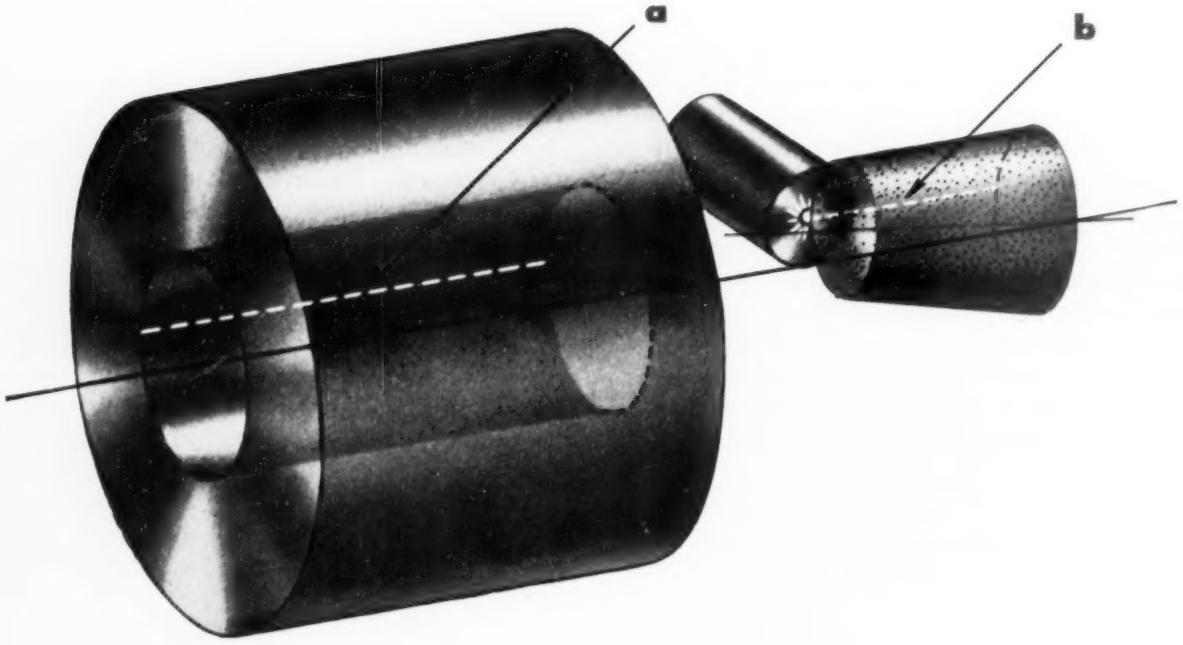


SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH *Lo-swing*

alignment

for better internal grinding

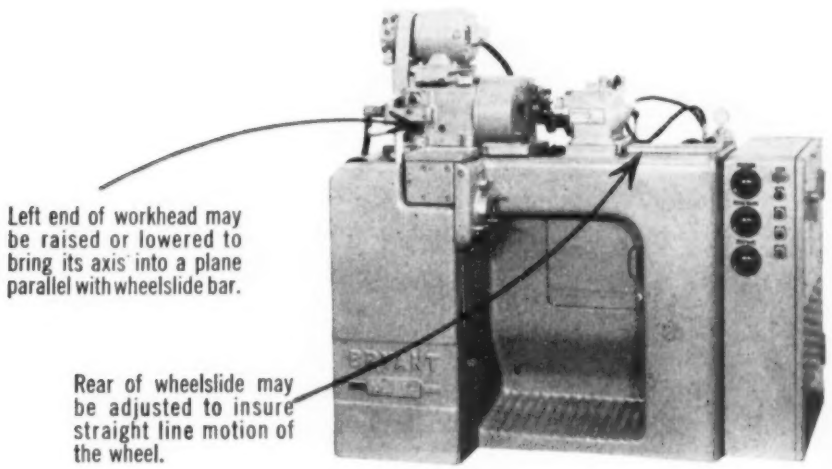


GRINDING a straight hole on an internal grinder is normally done with a straight (cylindrical) wheel. It is sometimes desirable to turn the wheelhead and dress the wheel to a taper in order to use a more rigid projection. However, this setup presents some serious obstacles which cannot be overcome unless they are clearly understood. In order to grind a straight hole the various elements of the machine must be in perfect alignment. The degree of alignment will be determined by the accuracy required on the finished part. A machine may be lined up sufficiently to produce holes within tolerance when grinding with a straight wheel, but if the wheel is turned and dressed to a taper, the alignment problem is magnified to such an extent that it may be impossible to produce holes within the same tolerance.

The center lines of the wheel, work and diamond must be in a common plane so that the wheel contacts the work at line "a". If the tapered wheel contacts the work above or below line "a" the wheel will touch only at its

largest diameter and, as the wheel reverses (at the left end of the hole), it will transfer its taper to the work resulting in a tight hole at the back. Turning the workhead or changing the length of traverse cannot overcome this error. Further, because of poor contact, wheel wear will be excessive and finish poor.

If the diamond is set either above or below line "b" (which is a continuation of "a") the wheel will be dressed to a curve (hyperbola) and even if the wheel contacts the work at line "a" it will be only a point contact. Again, the wheel form will be transferred to the work at the point of reversal, wheel wear will be excessive and finish poor. The proper setup calls for the work axis, wheel axis and diamond to be in a plane parallel to the longitudinal and cross motion of the machine.


Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.
Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

The Bryant 1109 Precision Internal Grinder is a semiautomatic machine, designed especially for grinding small bores. Although intended primarily for bore diameters of less than 1", it has a chuck swing of 9" and a maximum grinding stroke of 3½". By using preloaded bar slides for both cross and longitudinal slide movements, sensitivity is obtained without loss of rigidity. These rigid slides transmit the operating load directly to the base of the machine. The Bryant Hi-Frequency Wheelhead, providing speeds up to 100,000 R.P.M., is furnished as standard equipment to assure efficient surface speeds on the wheels necessary for griding small bores. Write for further information.

Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.

Internal grinders • Internal & External thread gages

ANACONDA METALS AT WORK

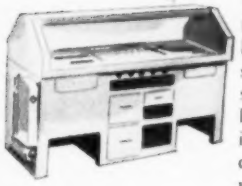
Meet the educated screw

This is a whole family of screws, known as Screwsticks, and joined head-to-toe. Insert a Screwstick in the driver, aim it at the hole—and from there on the Screwstick tightens itself to the predetermined torque, shears itself and gets its head burnished by the following screw which automatically advances itself. It's so fast that American Screw Co. of Willimantic, Conn., which uses ANACONDA Hexagon Brass Rod, refers to it as "jet propulsion".

Don't lose your grip

Once a novelty trick developed by the Chinese, the manufacture of these grips is now an industry. Made in a wide variety of styles and sizes by Economy Cable Grip Co. of Norwalk, Conn., they are used to anchor suspended electric power cables and to seize the end for pulling through ducts. The harder you pull, the tighter they grip. Needless to say, the ANACONDA Bronze Cable, Everdur* Rod and Copper Tube used in their manufacture never weaken from rust.

A fast delivery...with mustard



When baseball fans want their hot dogs, they want them fast—so Stainless Alloy Fabricators of Detroit built this "Double-Header" baseball park hot dog server. Its big capacity for hot dogs—and fast service—is its double bun warmer, one at each end, heated by copper water boilers. If the water runs dry, it's no strike-out. Boilers are made of phosphorized copper sheet with joints formed by fusing the edges with a Heliarc torch. No solder used, no seams to burn open.

How to treat a fracture

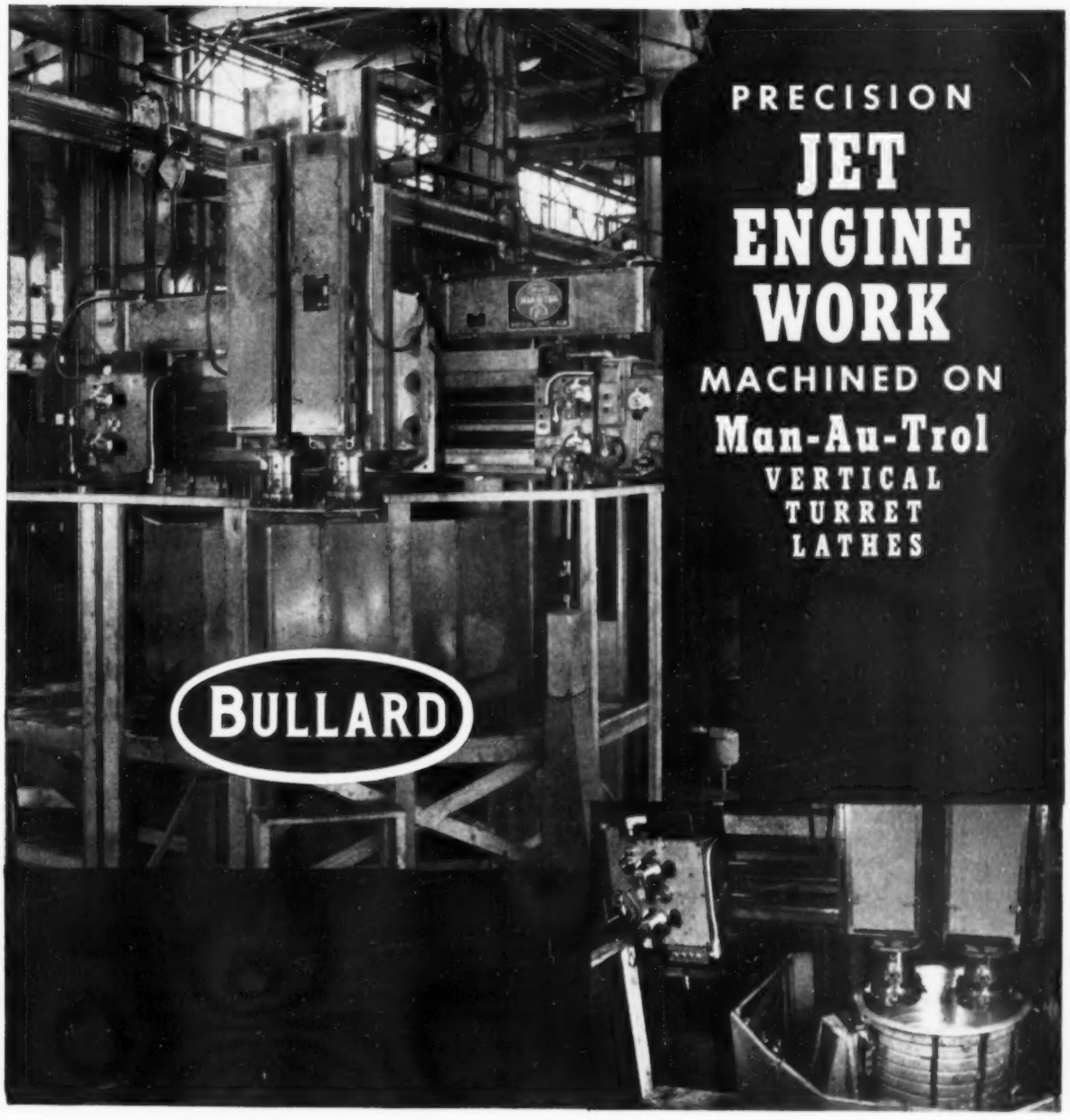
A fracture often means long uselessness—but that needn't be true of machinery. Usually braze welding can make it good as new and at a fraction of the time and cost of replacing it. This fractured cast iron conveyor drive sprocket, for example, would have taken two months to replace. The Universal Welding Co., Rochester, N. Y., repaired it in only 7 hours by braze-welding with ANACONDA-997 (Low Fuming) Bronze Welding Rod. Moral: don't count the patient out before consulting your welder.

There's more to this than meets the eye

In our Technical Department you will find a range of experience that covers the entire field of copper and copper-alloy applications in the metalworking industries. If you have a problem of metal selection, we are at your service. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Reg. U. S. Pat. Off. 6391

ANACONDA® the name to remember in COPPER-BRASS-BRONZE



OPERATION DETAILS

ROUGHING

Rough bore I.D. with right ram.
Rough face and counterbore, turn O.D. with left ram.
Rough 5 large grooves with right ram.
Rough 7 small grooves with left ram.
Underface bottom and turn O.D. with right ram.

FINISHING

Finish bore I.D. with left ram.
Finish face and counterbore with right ram.
Finish 5 grooves with right ram.
Finish 7 grooves with left ram.
Finish underface bottom.

"Ask for Estimates on Your Work"

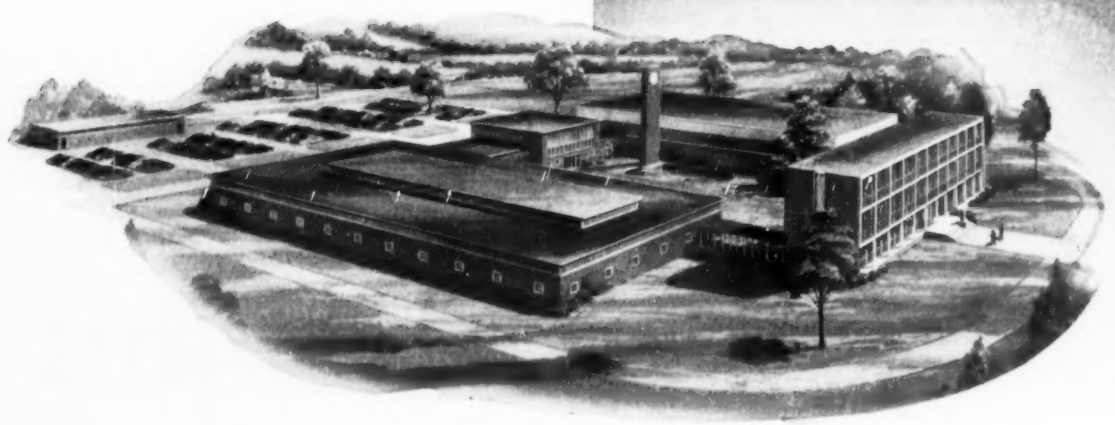
1 The year 1933 marked many automotive design and production advances. Among those on the production front was the first Detroit Broach tooling to broach connecting rods . . . an important advancement in terms of increased production, lower costs and better quality . . .

2 During the later thirties Detroit Broach continued to contribute to automotive broaching advancements. One example in 1938 was Detroit Broach tooling which made possible the complete finishing of main bearing caps cast in one piece in two passes . . .

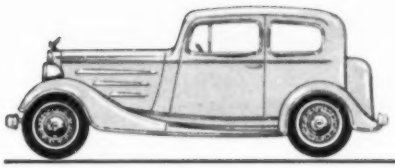
3 In the war years, the auto industry turned to war material and to Detroit Broach for the broach tooling for hundreds of parts. Typical was broach tooling to produce the rifling in gun barrels in a single pass and multiple-surface broaching operations on other gun parts . . .

4 Detroit Broach has continued to serve the auto industry in the post-war years. Tooling to broach differential cases, hinges, automatic transmission parts and innumerable other parts is helping to hold the line on rising production costs.

TODAY, automation has been introduced by Detroit Broach as an integral part of broach tooling. Parts are fed to, and carried away from, automatic broach tooling by specialized conveyor and hopper equipment. Tomorrow, too, one thing is sure . . . Detroit Broach will continue to pace the giant auto industry's need for better, more efficient production machining.

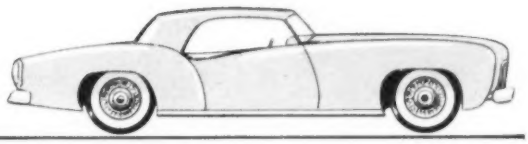


This is a view of the new, ultramodern Detroit Broach plant and offices located in Rochester, Michigan — just outside Detroit. Designed by Sture Frolen, eminent Swedish architect, it embodies many important advancements that contribute to employee morale and manufacturing efficiency. Another example of the unusual facilities of Detroit Broach Company.



Broaching Pioneers

IN THE AUTOMOTIVE INDUSTRY



Master of mass production techniques, producing at a level where pennies per piece mean thousands of dollars per year, the automotive industry was among the first to recognize the economies of broaching.

Early, too, came recognition of Detroit Broach ingenuity and reliability in the design and manufacture of tooling that would pace production requirements. A small sample of that tooling is shown at the left.

in YOUR industry, too you will find many companies who rely on Detroit Broach to meet their needs for tooling that slashes cost-per-piece, boosts output and provides consistent and repetitive top-notch accuracy.

Detroit Broach engineers, Detroit Broach facilities, in fact the entire Detroit Broach team, are all keyed to one specialized skill. That skill is broaching. It is such specialization that has resulted in many of broaching's greatest advancements.

It will pay you, too, to have a talk with the Detroit Broach representative in your area. You will doubtless find many ways to lower the boom on rising production costs on present as well as proposed operations.

Detroit Broach **COMPANY**

3164

ROCHESTER, MICHIGAN

Offices in Principal Cities Throughout the World

For the long haul... Autocar relies on RB&W bolts

Famous truck builder rates them best for ease of assembly and accessibility

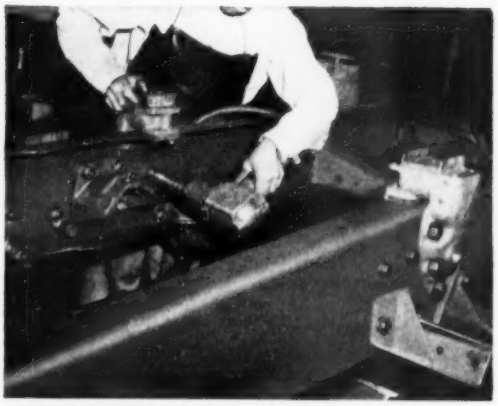
It's been a long time since the Autocar people switched from riveted to bolt-and-nut construction. Here's how it happened:

Two Autocar engineers took off on a coast-to-coast run to shake the bugs out of a new test model. Things went well until a riveted spring bracket broke. It took an entire day just to chisel through the rivets because it was hard to get at the bracket.

From that day on, it was *accessible* bolt-and-nut construction exclusively for all Autocar trucks. And Autocar standardized on RB&W bolts. One dividend from using these rugged bolts is that Autocar can specify higher-strength material than is practical for riveting. Furthermore, tests on structures like bridges show that rivets frequently loosen. This doesn't happen to bolts on Autocar frames.

Where you want to join structural members firmly together so they'll *stay* together for good, high-strength bolting is often your best bet.

As the leading manufacturer of all kinds of fasteners, we're in the unusual position of always being able to recommend and supply the right ones for all your needs. Write to RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, N. Y.



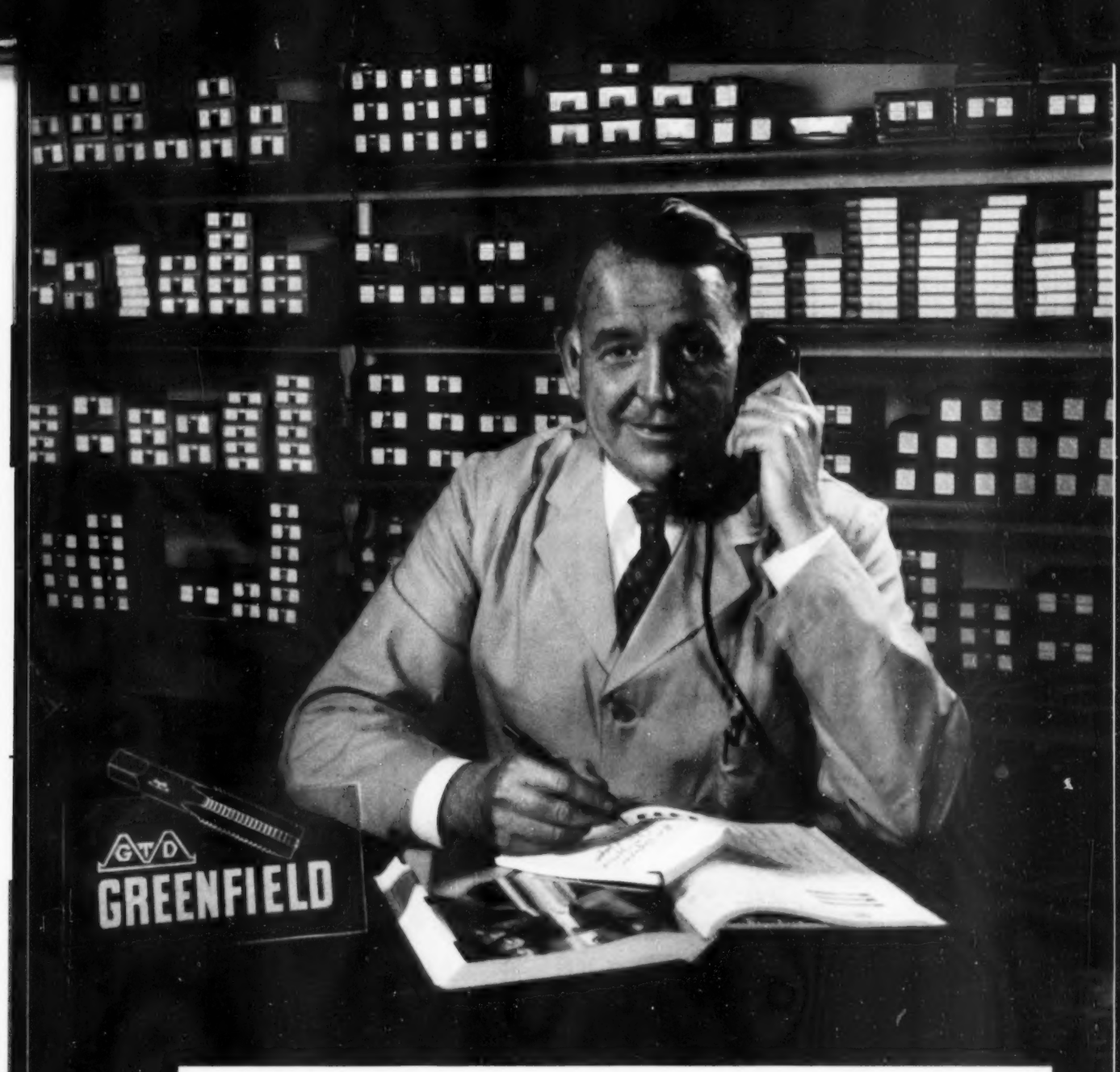
FASTER FASTENING is achieved in the Autocar plant at Ardmore, Pa., by using air tools like the one shown here to run up RB&W nuts on RB&W bolts on an Autocar truck frame. In addition to making tight, accessible joints, bolting effects substantial assembly savings.

3.1

RB&W

108 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N. Y., CORAOPOLIS, PA., ROCK FALLS, ILL., LOS ANGELES, CALIF. *Additional sales offices at:* PHILADELPHIA, PITTSBURGH, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO. *Sales agents at:* PORTLAND, SEATTLE. *Distributors from coast to coast.*



"YES...WE'VE GOT THOSE TAPS IN STOCK"

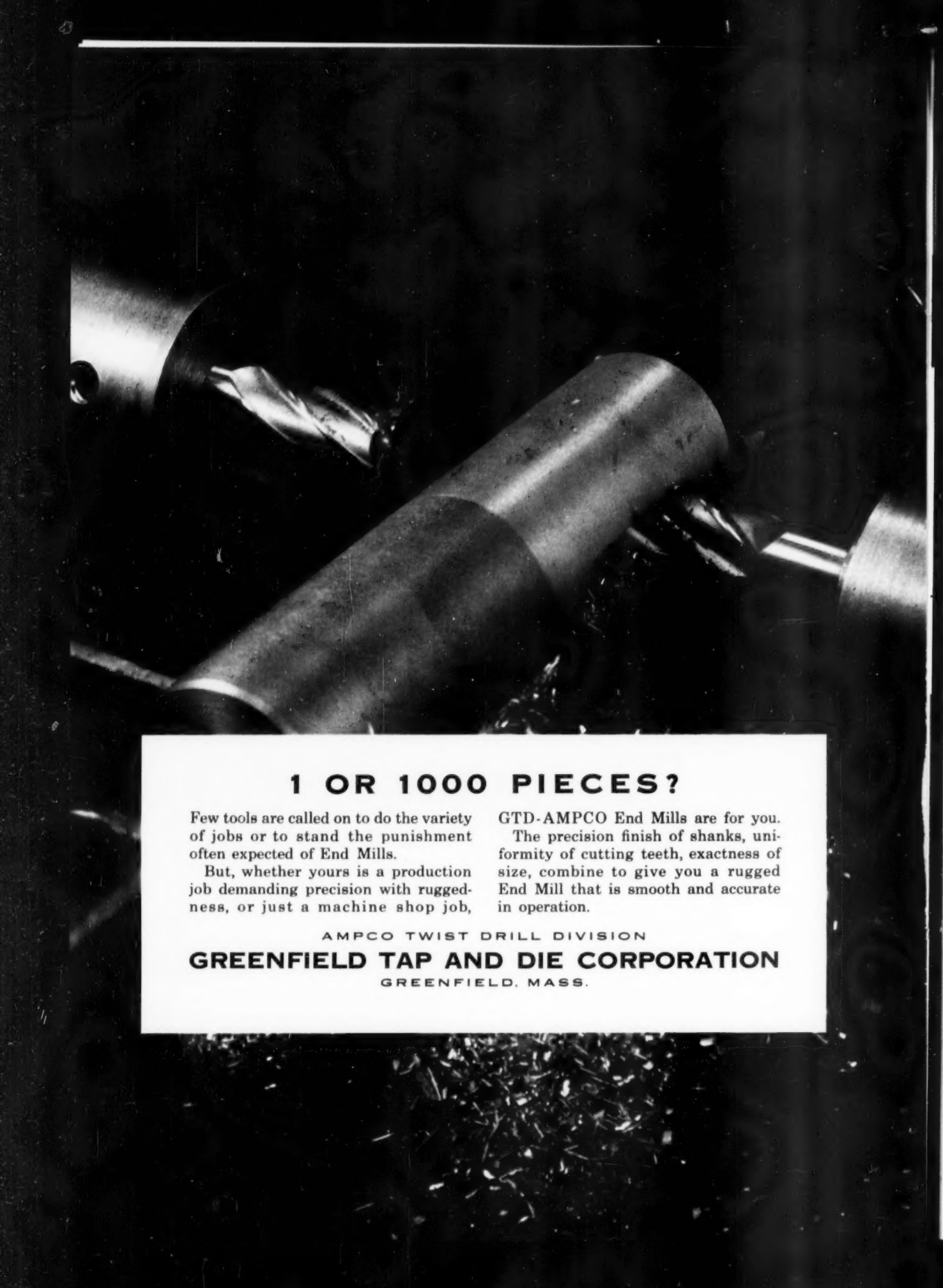
That's your INDUSTRIAL DISTRIBUTOR talking. Many a time, no doubt, you've heaved a sigh of relief when you've heard the welcome words, "Sure we've got 'em", or when you need service, "We'll send Jack right over".

And your GTD-GREENFIELD Distributor also has direct friendly contact at the factory with men he knows well, regarding non-stocked items or special tools.

Yes, it will pay you to get better acquainted with your GTD-GREENFIELD Distributor. Stop shopping around . . . stop buying the hard way.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.



1 OR 1000 PIECES?

Few tools are called on to do the variety of jobs or to stand the punishment often expected of End Mills.

But, whether yours is a production job demanding precision with ruggedness, or just a machine shop job, GTD-AMPCO End Mills are for you.

The precision finish of shanks, uniformity of cutting teeth, exactness of size, combine to give you a rugged End Mill that is smooth and accurate in operation.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

100-kw Allis-Chalmers induction heater with A-C designed work fixture.

Brazes 360 Shells Per Hr.

Brazing nose adaptors on 105 mm projectiles is a tough job. It demonstrates the real potential of Allis-Chalmers induction heaters.

Because of the problems involved, only induction heating is capable of providing the precise heat control required on a high production basis. For example, too much heat will affect the shell and burn the flux. Too little heat and solder will not pull into threads. In addition, heat must be applied at just the right point or solder will flow out of joint without flowing up threads.

Allis-Chalmers induction heaters provide both the high quality and high production required.

This same versatile Allis-Chalmers induction heater can also be used for soldering, annealing, case and through hardening. A simple change of work coils is all that's needed to switch from job to job.

Find out about the spectacular cost reductions you can make in your shop with an Allis-Chalmers induction heater. There may be complete data in A-C's electronic laboratory on a job similar to yours. For complete information call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

SEND FOR

Allis-Chalmers
Milwaukee 1, Wisconsin

Send latest information on Allis-Chalmers induction heaters.

Name .....

Title .....

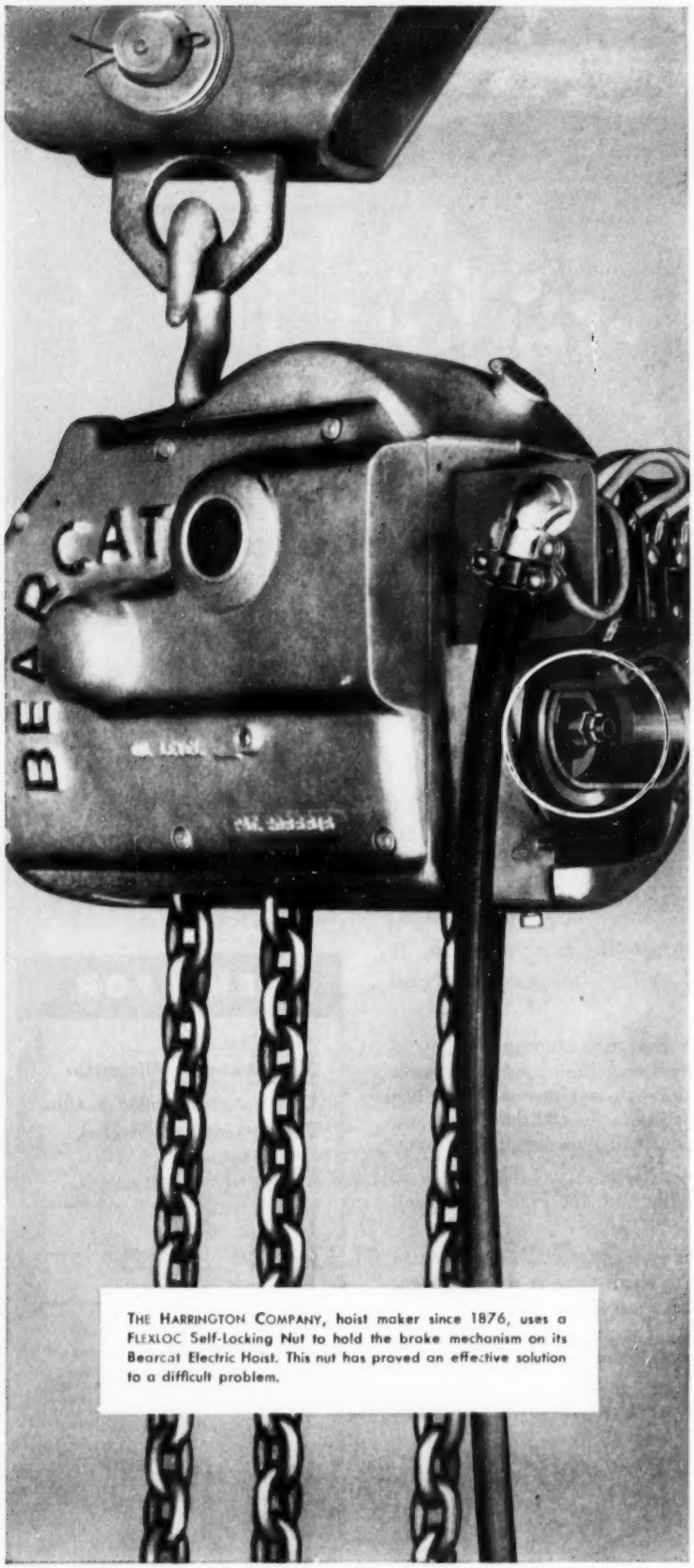
Company .....

Street .....

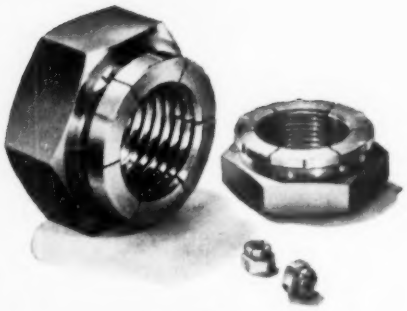
City ..... State .....

A-4119

ALLIS-CHALMERS



THE HARRINGTON COMPANY, hoist maker since 1876, uses a FLEXLOC Self-Locking Nut to hold the brake mechanism on its Bearcat Electric Hoist. This nut has proved an effective solution to a difficult problem.



Why FLEXLOCs are better locknuts

Compare the features of FLEXLOCs with those of any other nut, and you'll readily see why we say they are better locknuts.

FLEXLOCs are one piece, all metal. They require no lockwasher, no cotter pin, no auxiliary locking device to keep them on a bolt. They are not affected by moisture, dust or high temperatures. Standard FLEXLOCs are designed for temperatures up to 550° F.

FLEXLOCs are stop and lock nuts. They won't work loose once their locking threads are fully engaged; therefore they stay put anywhere on a bolt. Seating is unnecessary. And FLEXLOCs can easily be removed from a bolt and reused again and again without losing their locking ability.

For more information about FLEXLOCs and samples for test purposes, see your FLEXLOC distributor, or write SPS, Jenkintown 1, Pa.

FLEXLOC®

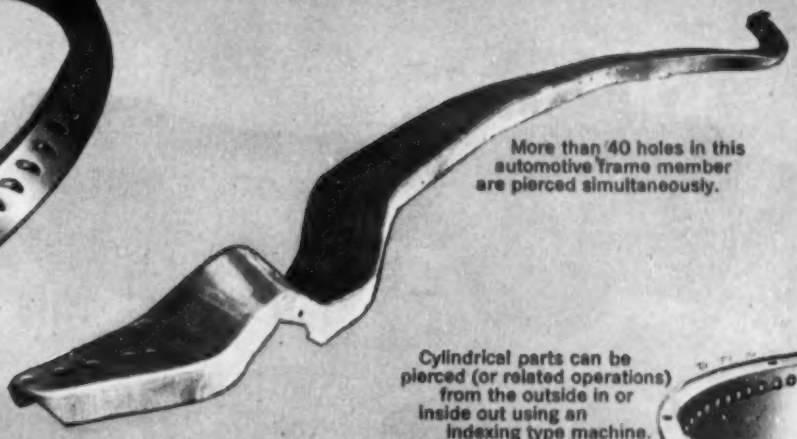
LOCKNUT DIVISION

SPS

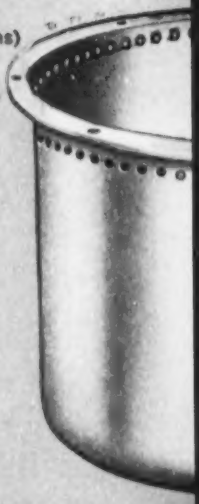
JENKINTOWN PENNSYLVANIA

Our Fiftieth Year : A START FOR THE FUTURE

Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.



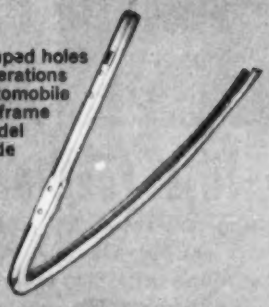
More than 40 holes in this automotive frame member are pierced simultaneously.



Cylindrical parts can be pierced (or related operations) from the outside in or inside out using an indexing type machine.

High Production Piercing...

IN A SINGLE SET-UP



Seven irregular shaped holes and two trimming operations complete this automobile door inner window frame in one setup. Model changes can be made at little expense.

Based on a recent development in piercing technique, you can pierce more holes simultaneously—faster and with greater accuracy—on Danly Metalworking Equipment. Eliminate awkward multiple handling . . . pierce all holes faster in a simple, single set-up.

Built specifically for your piece part, these are only a few of the advantages of Danly Hydraulic Metalworking Equipment:

FREE

Write for this Bulletin today!

Consider these important features!

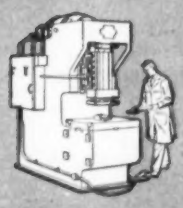
- ***HIGH CAPACITY***—Up to 225 tons available per cylinder.
- ***BREAKTHROUGH SHOCK PRACTICALLY ELIMINATED***—Permits greater capacity without hydraulic circuit or tool trouble . . . smoother, faster.
- ***AUTOMATIC STRIPPING***—An integral feature of every cylinder . . . each station hydraulically strips its punch. This unique action simplifies fixturing, is practically foolproof.
- ***ACCURACY, FLEXIBILITY***—Pierces practically any type of hole . . . round, oblong or irregular to very close tolerances.

DANLY®

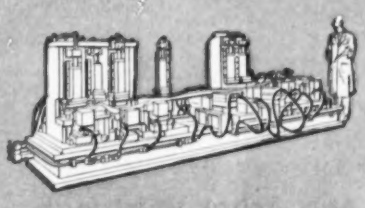
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

HYDRAULIC METALWORKING EQUIPMENT
MECHANICAL PRESSES 50 TO 3000 TONS

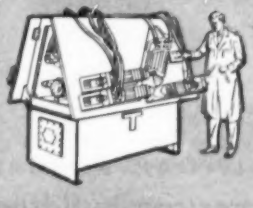
DANLY HYDRAULIC METALWORKING EQUIPMENT



General Purpose Gap Frame Piercing Press

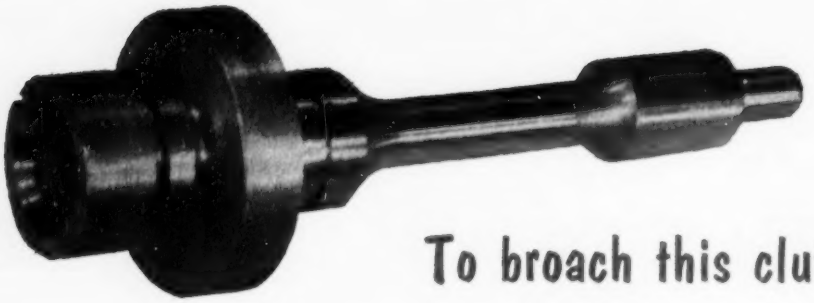


Automotive Frame Piercing Machine

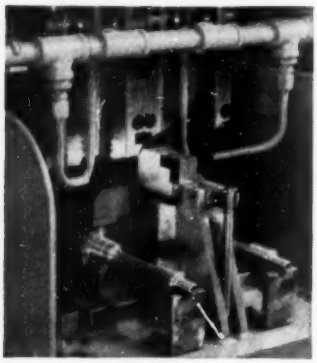


Automotive Inner Window Frame Piercing Machine

Jet Engine Shroud Ring Piercing Machine



To broach this clutch gear...



use this *American* machine... in this fashion...

...to get this result!

Approximately 300 clutch gears per hour can be broached on this American 3-Way Type Vertical Hydraulic Broaching Machine. A two station fixture is provided to locate parts in V-shape locators. Air clamping locks the parts into place. At the end of the broaching stroke the parts are automatically unclamped and the operator unloads them while returning the machine ram to starting position.

Flats approximately 5/16" wide are broached on the diameter of the large end of the gear.

This broaching operation is a standard operation on a standard American machine. If your problem is more difficult, American has the experience and skill to devise a special machine, fixture or broach for your purposes. Send a part-print or sample for a recommendation leading to a solution of your broaching problem. Or send for catalog #300 which illustrates and describes standard American machines.

American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
American Building - Ann Arbor, Michigan

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

GREEN LIGHT

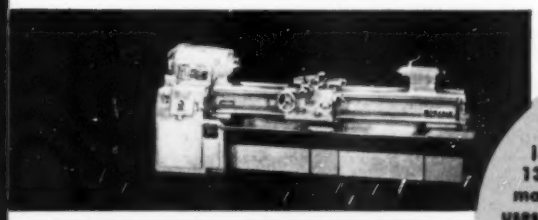
FOR DEAD-CERTAIN TURNING

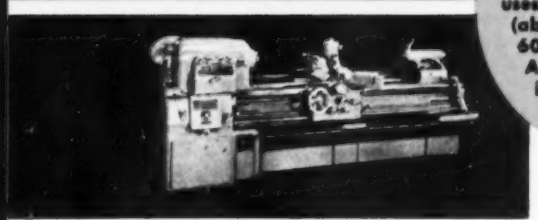
Figure the job, maybe, to plus or minus .001". Set it up to a gnat's eyebrow. Work out speeds and feeds to the optimum. And what's it all worth—quality- and cost-wise—if bedway wear has begun to warp the lathe's intrinsic trueness?

So it's an absolute "must", for good operation, to have carriage and tailstock bedways that stand up for the life of the lathe. Like Monarch flame-hardened ways. With Monarch lathes, you get bed castings of strong, dense, wear-resistant nickel-alloy cast iron. You get them flame-hardened to a depth of ⅛" plus, to a Scleroscope reading of 70 to 72 Shore—followed by grinding to .0005" (overall). And *that* gives you a lathe with bedways as hard as hardened steel—but with Martensic structure blended into the tough, fine Pearlitic iron underbody with its retained graphitic carbon. Integration plus! Hardness plus! Lubricant-retention plus!

Our method is more demanding, more expensive. But it gives *you* no worries about uneven wear of loosened steel strips—about different coefficients of expansion—about bed rigidity lost by cutting and drilling for inserts—about abrasion. And it gives *us* unsolicited reports like this: "No appreciable bed wear after over a million cycles!"

The Series 60 Lathes shown here, like *all* Monarch lathes, have Monarch flame-hardened and ground bedways. And more—much more! Write, please . . . *The Monarch Machine Tool Company, Sidney, Ohio.*





Monarch's most universal lathe. Available in 13", 16" & 20" swings, many lengths, for many uses. 13" Toolmaker's Lathe (above). Below, 16" Series 60 Engine Lathe with Air-Gage Tracer. For information, request Booklet #1113.

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Another typical

Morris

MOR-SPEED

production machine

performance record

35% SAVINGS IN LABOR

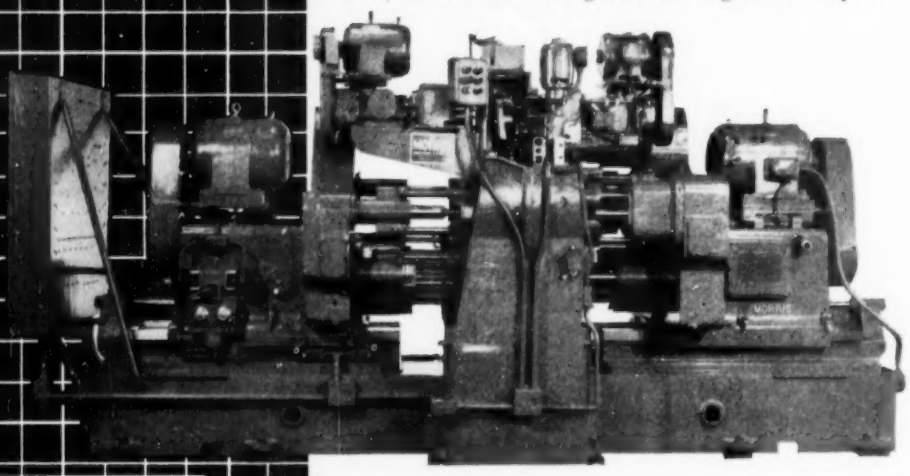
REPLACES 6 OLDER MACHINES

PAYS FOR ITSELF IN 9 MONTHS

The two way horizontal, eight station, automatic indexing machine illustrated drills, reams, countersinks, forms radius and taps 187 refrigeration unit cylinders per hour.

This unit is equipped with nineteen drilling spindles, fourteen countersinking spindles, four counterboring spindles, one reaming spindle and eleven tapping spindles. Twenty spindles are in the left hand head and eighteen in right hand head.

If your work requires numerous operations on a mass production basis, consult us. Our engineers are eager to serve you.



OPERATIONS PERFORMED:

Drill, countersink and tap 8,—¼"—28 tap holes

Drill, ream and chamfer both ends of 1⅛" hole

Counterbore for ⅝" dia. segment

Drill, countersink and tap 1—$^{8}/_{32}$ tap hole

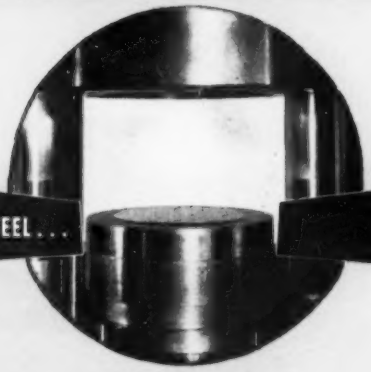
Drill, countersink and tap 2—$^{3}/_{8}$—24 tap holes

***Refrigeration Unit Cylinder**

Morris **THE MORRIS MACHINE TOOL CO.**

933 Harriet Street, Cincinnati 3, Ohio

"A Better Product at Less Cost with PRECISION PLUS PRODUCTION."



WITH A BLANK OF STAINLESS STEEL . . .

GET THESE RESULTS BY

Hydroforming

DEEP DRAW IN 1 OPERATION

5 ½" High—4 ¼" Dia.
COVER OF .035"
TYPE 305 STAINLESS

Drawn to depth indicated with recessed top in 1 operation.

PRESERVE SURFACE FINISH

4" Sides
CORNER BALL OF 20 GA.
TYPE 302 STAINLESS

Pre-polished blanks coated with protective plastic were drawn to shape with plastic coating completely intact.

HOLD CLOSE TOLERANCES

1 ⅛" Dia.
DIAPHRAGM OF .010"
TYPE 304 STAINLESS

Two parts mate with an air-tight fit.

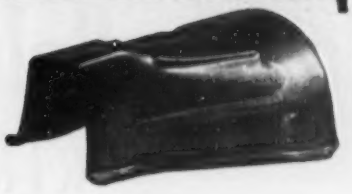
FORM INTRICATE SHAPES

6" Long—3" Tee section
MANIFOLD OF .040"
TYPE 347 STAINLESS

Short-run aircraft part formed using Kirksite punch in 1 operation.

3" Long—1 ½" Wide
CROSS-OVER DUCT OF .035"
TYPE 321 STAINLESS

Drawn with contoured flange in 1 operation.



3" High—8" Long
JET-ENGINE DUCT OF .032"
TYPE 321 STAINLESS

Shape with open ends, having intricate surface detail, formed in 1 operation with minimum springback.

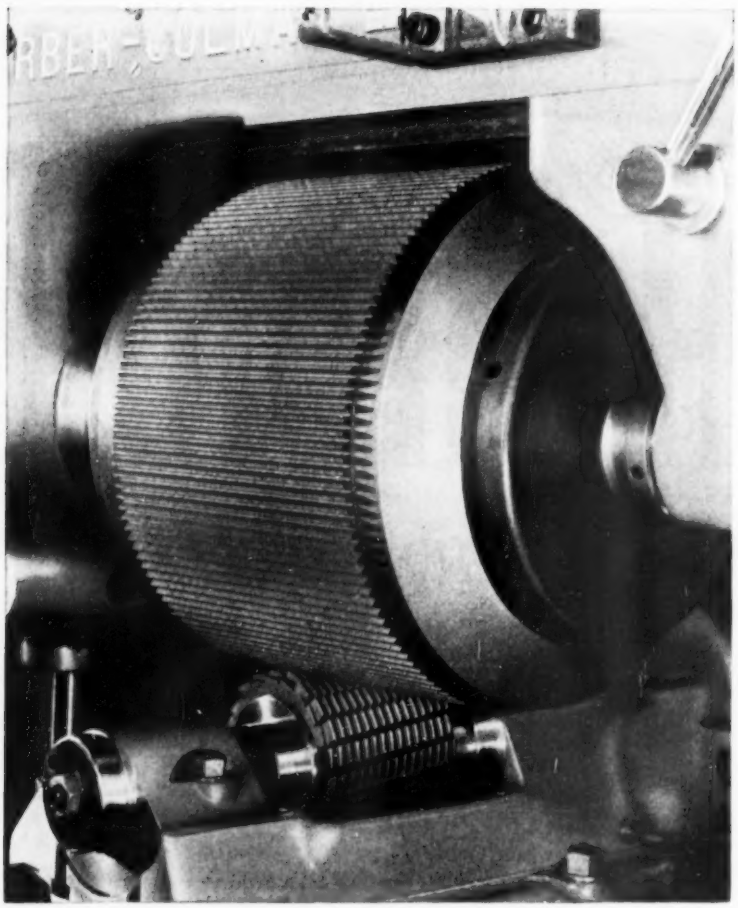
With the tremendous power available, the cold drawing and forming of stainless steels present no problem to the Hydroform. With its unique drawing action and continuously controlled forming pressure, most parts are drawn in a single operation.

Tool costs are reduced 70% or more, as a male punch and a simple draw ring are the only tools required. Expensive die sets, with their attendant high maintenance costs, are eliminated. The cushioned action of the flexible die member forming the material to the punch reduces punch wear and minimizes the possibility of galling.

Contact your nearest Cincinnati Milling field engineer for complete details on Hydroforming. For a description of the five sizes of Hydroform machines, write for Bulletin M-1759-2.

CINCINNATI Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.



Barber-Colman HOBBING BOOSTS RING GEAR PRODUCTION!

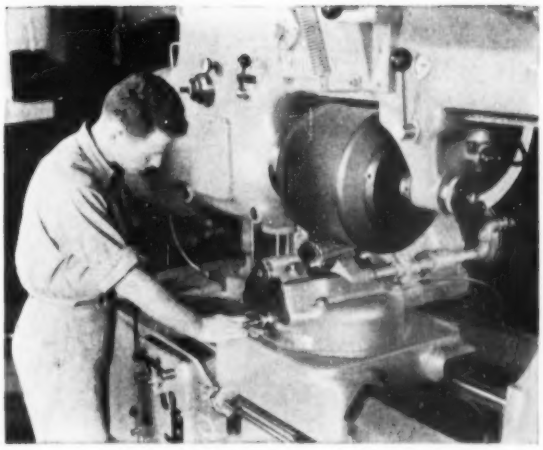
1 Gear Every 1-1/2 Minutes

This Barber-Colman No. 14-15 Hobbing Job is typical of how Engineered Hobbing pays off on gear production problems. These flywheel ring gears are nearly 15″ in diameter, with 146 teeth and .375″ face width. They are hobbed 24 per load at the rate of 36 minutes floor-to-floor, or 1-1/2 minutes per gear. Blanks are formed by rolling flat stock into a ring and butt-welding. The rings are then mounted on specially-designed work arbors and hobbed at .100″ feed per revolution and 75 hob rpm.

BUILDERS OF PRECISION GEAR

2300 Gears Per Hob Life

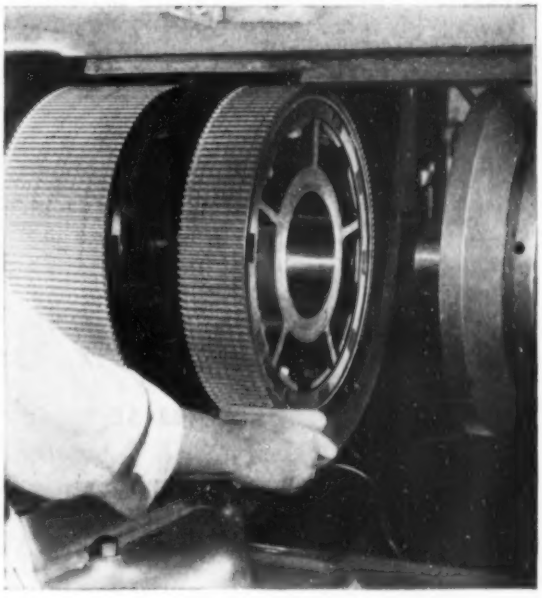
On this job 2300 gears are cut per hob — about 195 pieces per sharpening. Low-cost unground Multithread hobs are used. Multithread design, with its increased indexing speed, has reduced total time to 1-1/2 minutes per gear. Fast loading and automatic hobbing cycle reduce operating costs to a minimum.



ENGINEERED HOBBING PAYS OFF!

Tooling Suits Specific Problems

Barber-Colman Engineers designed special mandrels to hold 8 of these large diameter blanks per load. The mandrels are mounted three on the arbor (24 blanks) for each cutting cycle. Blanks are pressed onto the mandrel prior to hobbing, thus reducing loading time between cycles. A special loading fixture aids the operator in lifting and positioning the mandrels on the arbor.



Fast, accurate gear hobbing — with tool costs far below comparable methods — gives you the best possible approach to high-production gear output. Rigidity of the Barber-Colman No. 14-15 Hobbing Machine allows the use of high feed rates and the fast indexing which is inherent with Multithread hobs. Special tooling eliminates job kinks and difficulties. Let Engineered Hobbing work for you, too. Call your Barber-Colman representative and ask him for recommendations on your gear cutting operations.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

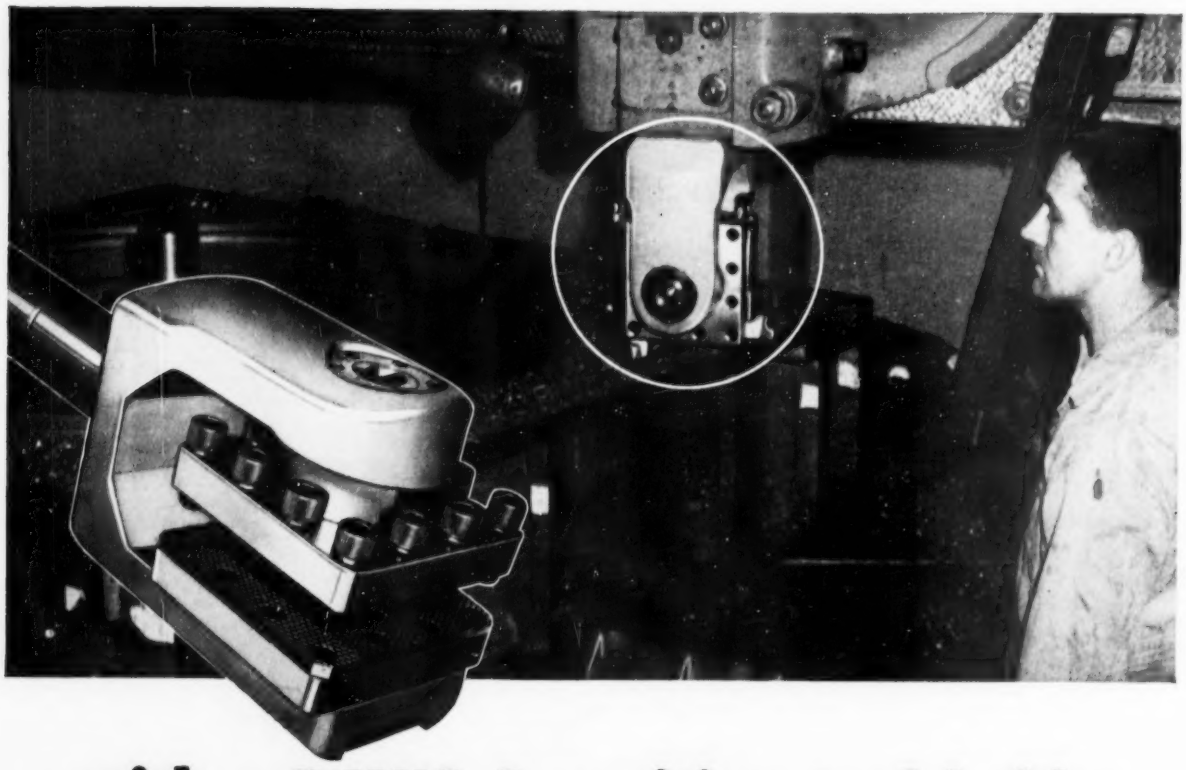
BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 618 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

HOBS AND MACHINES SINCE 1911

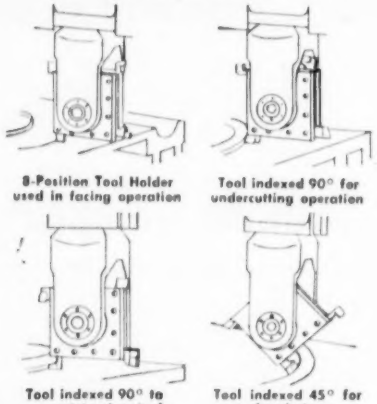
Perform *four* operations from a *single* setup...



—with a DAVIS 8-position tool holder

speeds work, reduces setup costs on vertical boring and turning mills

Typical series of operations on a single setup



8-Position Tool Holder used in facing operation

Tool indexed 90° for undercutting operation

Tool indexed 90° to present turning tool

Tool indexed 45° for chamfering

NOW, save more setup time than ever before possible! With this new Davis Tool Holder you can turn, undercut, bore and chamfer in one setup. You can mount four tools at once.

One simple wrench adjustment will change your position through 360° in accurately indexed increments of 45°. Two index pins and a center pin locate and clamp the complete assembly in rigid alignment. Heavy cast steel body assures accuracy.

Increase your production with your present equipment . . . solve the age-old problem of too numerous setups, too many tool changes. For details on the Davis 8-Position Tool Holder, see your representative or write direct.

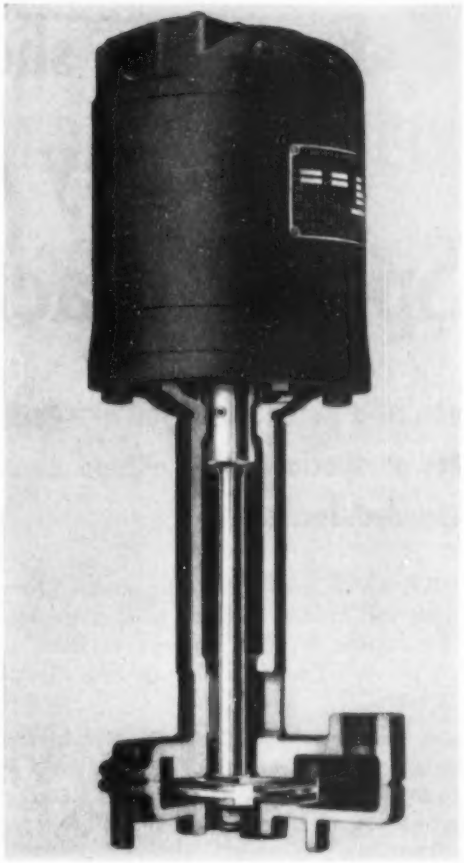
If Davis can't bore it, it can't be done!

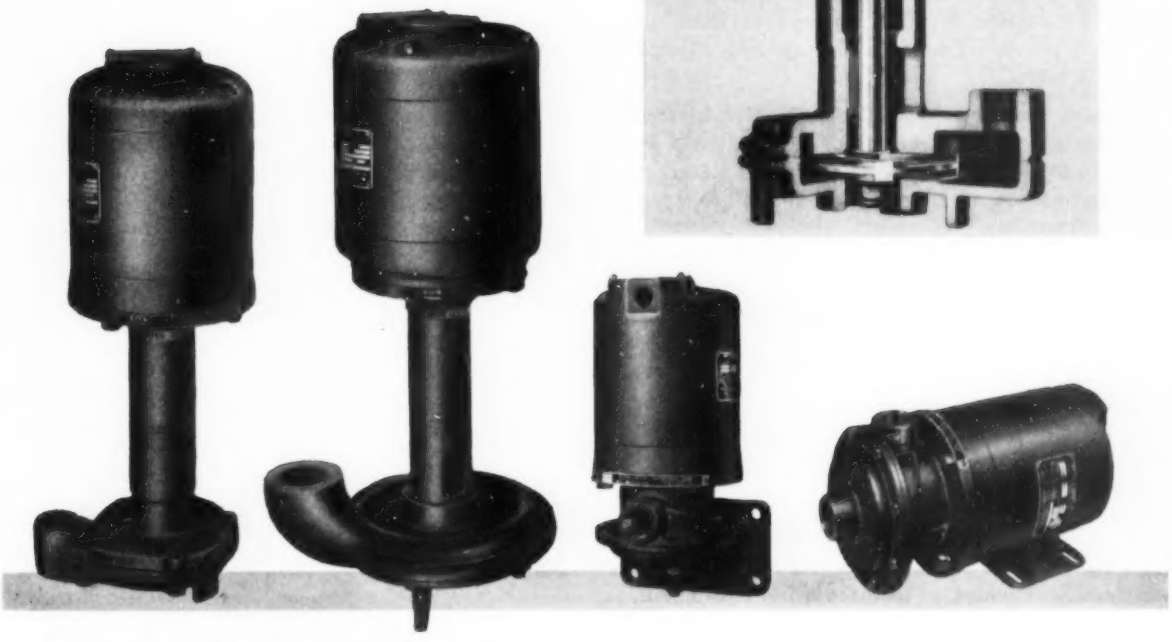
DAVIS BORING TOOL DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO., FOND DU LAC, WISCONSIN

Builders of plain and micrometer adjustable block type boring tools; line boring bars; special boring tools; car wheel boring tools; planer, vertical boring and turning mill tools; Quick Change arbors and sleeves.

Motor-Driven Centrifugal Pumps That Dirt Can't Hurt!





Here's a complete line of ten different Motor-Driven Centrifugal Pumps that are completely protected from damage by dirt or abrasives. Hydraulically balanced, their design provides stability without using a bearing at impeller end of shaft . . . eliminates metal-to-metal contact below water level. All motors are of standard NEMA design, for easy replacement, and totally enclosed against dust or vapor . . . no lubrication or maintenance required.

You'll find that the design simplicity and sound construction of these Brown & Sharpe Pumps makes them ideal for countless applications where grit or foreign substances may be present. Write for Pump Catalog. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

B·S

Brown & Sharpe

Facts you should know about Kearney & Trecker's Special Machinery Division

If you're a potential buyer of special machines or special tooling – read about our expanded facilities

THOUGH we've been designing and building standard and special machine tools since 1898, limited production facilities for special machines previously prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or specially to adapt standard equipment to solve specific metalworking problems.

Check our qualifications:

EXPERIENCE: We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our production of special machinery has ranged up to $3,000,000 annually.*

FACILITIES: The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than *$2,500,000 worth of new tools and equipment.*

PERSONNEL: The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying to metalworking the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

PERFORMANCE: Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These include high production requirements as well as exacting dimensional accuracies and surface finishes.

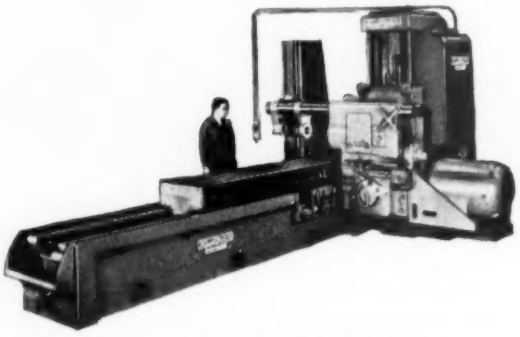
RESPONSIBILITY: Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



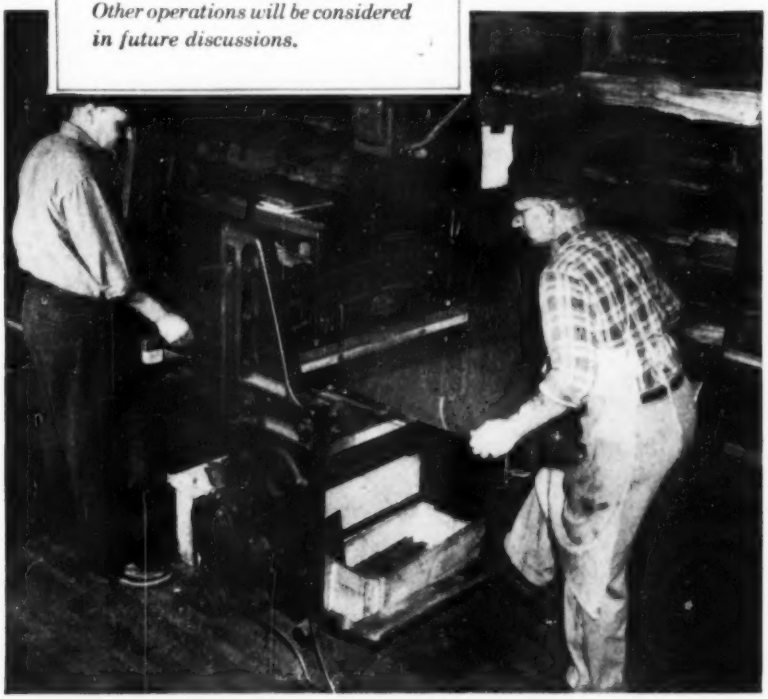
We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a 50 hp CSM Simplex milling machine we designed and built for a leading manufacturer.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

SOME ANSWERS TO YOUR SHOP QUESTIONS ON

cold cutting straight-chromium Stainless Steels

This is another in a series of advertisements discussing the straight-chromium grades of Stainless Steel from the standpoint of fabricating performance. Other operations will be considered in future discussions.



Type 430 Stainless Steel sheets sheared for use in TOASTMASTER Roll and Food Warmers

Shearing 18 and 24 gage sheets is the first step in fabrication of the famous Toastmaster line of restaurant Roll and Food Warmers from Type 430 Stainless Steel.

McGraw Electric Company, Elgin, Ill.—which manufactures these products—reports no difficulty in shearing the Type 430 Stainless sheets or in any of the fabricating operations which follow, including punching, forming, blanking and spot welding.

COLD cutting operations with straight-chromium Stainless Steel present no special problems to the fabricator who keeps this thought in mind: it takes more power to cut Stainless Steel than an equivalent gage in mild steel.

As a general rule, a shear should have a capacity in mild steel four to five gages heavier than the Stainless being sheared. Resembling carbon steel in performance, straight-chromium grades have a tendency to "break out" sooner than nickel-bearing grades.

This same characteristic holds true in blanking and punching, and clearances should be held about the same as for plain carbon steel. Blanking and punching dies should be of the best grade of tool steels.

In perforating straight-chromium grades, punches should be set as for plain carbon steel and more power should be used. It is not advisable to attempt to perforate straight-chromium grades if the holes are smaller in diameter than the thickness of the stock.

Our representatives will be glad to help you with any problems that you may encounter in using U·S·S 17 (Type 430) Stainless Steel and any of our other straight-chromium grades.

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

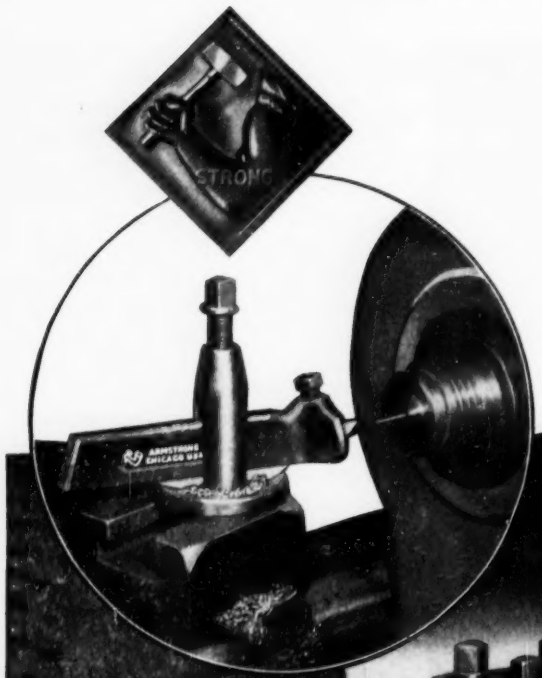
U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS

UNITED STATES STEEL

ARMSTRONG
TOOL HOLDERS...
for every operation!



There are **ARMSTRONG** Tool Holders in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of **ARMSTRONG HIGH SPEED, ARMALOY** (Cast Alloy) and **ARMIDE** (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

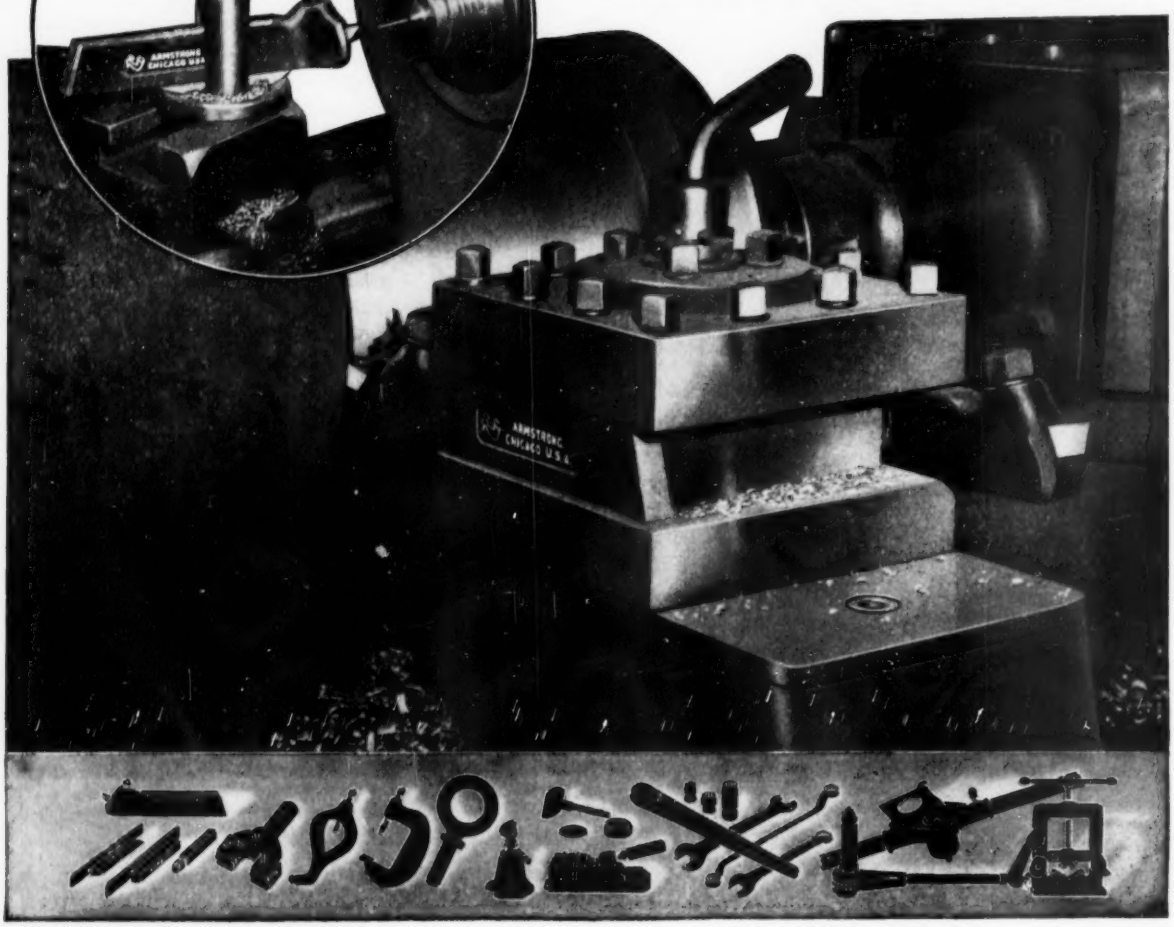
These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. Armstrong Ave. Chicago 30, Ill.



It MUST have been good!

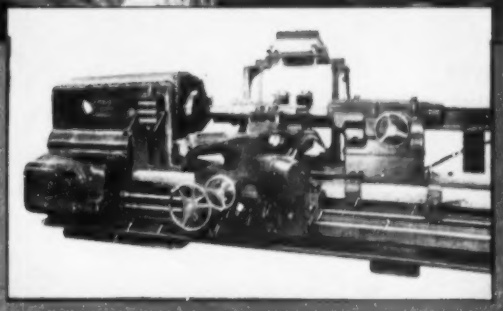
There are times when expressions speak louder than words.

Here's a group of distinguished steel mill roll executives watching a demonstration on a 26" Capacity "AMERICAN" Hydraulic Roll Lathe—judge for yourself whether or not they are satisfied with what they saw.

These machines are performing "miracles" in savings in many of the best known roll shops in the country. They have introduced a brand new machining technique that has revolutionized the art of roll turning. They reproduce work shapes from a template faithfully and accurately not only on steel mill roll bodies and necks, but on such work as spindles, motor shafts, valve stems, step shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

Evidence from hundreds of installations proves beyond a shadow of a doubt their leadership as top-flight cost reducers. Was there ever a time when cost reduction was more urgently needed?

If it's proof you want just drop us a line—no obligation.



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Famous for "firsts"... BELL *Aircraft*

Famous

"FIRSTS"

by BELL Aircraft

Produced with the help of Lake Erie Hydraulic Presses

FIRST
Supersonic Aircraft (X-1)

FIRST
Aircraft to Vary Wing Sweepback in Flight (X-5)

FIRST
Jet-Propelled Fighter in U. S. (F-59)

FIRST
Commercially Licensed Helicopter

Record of

LAKE ERIE PRESS PURCHASES

by BELL Aircraft

DATE	NUMBER	TONNAGE
1937	1	750
1939	1	2500
1940	1	275
1941	1	275
1942	1	5000
1943	1	275
1943	1	5000
1943	2	275
1943	→	500
1951	1	400
1952	1	7000

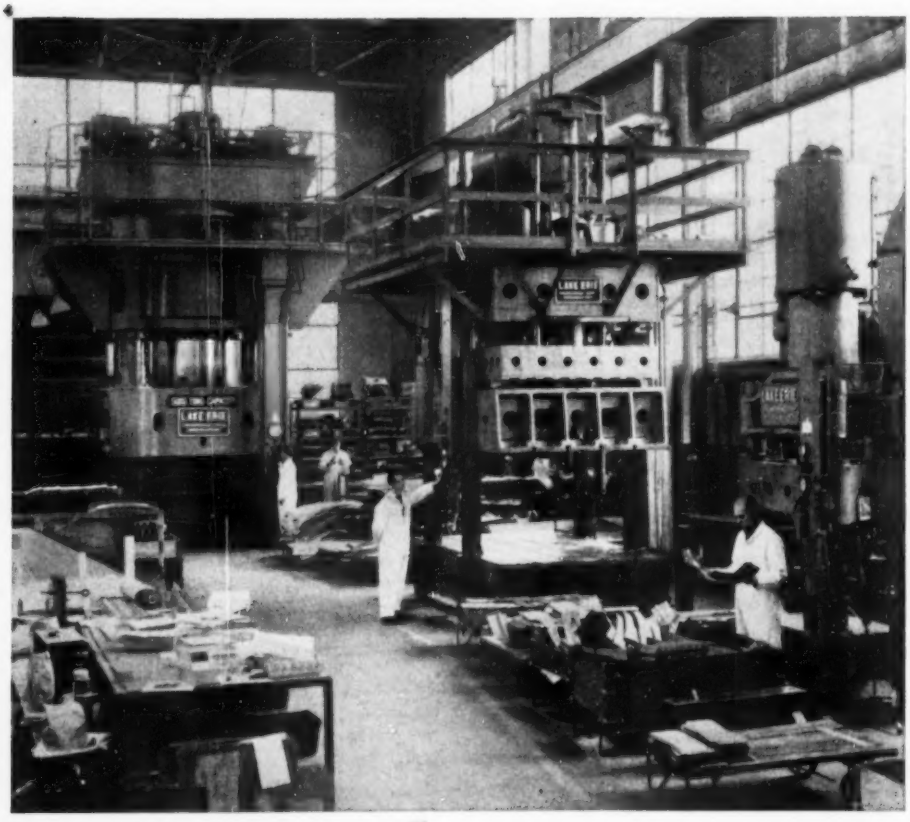
ABOVE. New 7,000 ton press is shown producing Bell helicopter parts...in this instance left-hand aft sills for the HSL-1 engine compartment. Material is 58.00" long by 6.50" wide by .091" thick. Two flanges and a contour are formed. Depth of draw is 3". Pressure required is 5,000 tons. Another new Lake Erie press appears in the background. It is a triple action model with a 400 ton capacity.

Other prominent Lake Erie Press users in the Aircraft Industry

Aeronca Aircraft Corporation
AiResearch Manufacturing Company
Beech Aircraft Corporation
Bellanca Aircraft Corporation
Bendix Aviation Corporation
Boeing Airplane Company
Consolidated Vultee Aircraft Corp.
Curtiss-Wright Corporation
Douglas Aircraft Company, Inc.
Fairchild Engine & Airplane Corporation
General Electric Company Aircraft Gas Turbine Division
Goodyear Aviation Corporation
Grumman Aircraft Engineering Corporation

places LAKE ERIE *FIRST*

...when it comes to Hydraulic Presses

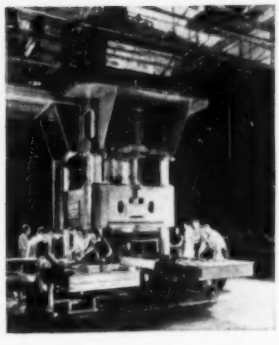


The 15th Lake Erie Press Purchased by Bell is a 7,000 Ton Unit for the New Helicopter Plant at Fort Worth

Bell Aircraft Corporation purchased its first Lake Erie press in 1937. Since then, 14 additional Lake Erie Presses have been added. These 15 presses have 5 different designs and six different capacities ranging from 275 to 7,000 tons. This year-in year-out satisfaction of Bell Aircraft and the variety of Lake Erie equipment involved are significant:

1. They reflect the competence and versatility of Lake Erie designers and builders.
2. They demonstrate that Lake Erie presses do their jobs with gratifying efficiency.
3. They prove that Lake Erie presses give years of the utmost satisfaction.

These are sound reasons why it is always good business to call in Lake Erie when hydraulic presses are under consideration.



ABOVE. A corner of the press room in the Bell Aircraft plant at Buffalo shows three Lake Erie presses with capacities of 5,000 tons, 750 tons and 275 tons respectively. The range in sizes and types, and the versatility of Lake Erie presses are a big asset to airframe, jet engine and accessory manufacturers.

LEFT. Bell's 5,000 ton Lake Erie press shown equipped with a rubber pad. Lake Erie presses of this type are available in capacities from 500 to 7,000 tons producing up to 2,000 p.s.i. on the work. High speed hydraulically operated loading tables or electrically operated tables (as shown above) are available for all press sizes.

LAKE ERIE
HYDRAULIC
PRESSES

Lockheed Aircraft Corp.
Glenn L. Martin Company
North American Aviation, Inc.
Northrup Aircraft, Inc.
Piasecki Helicopter Corp.
Piper Aircraft Corporation
Republic Aviation Corp.
Solar Aircraft Company
Thompson Products, Inc.
United Aircraft Corporation
Chance Vought Aircraft Division
Pratt & Whitney Aircraft Division
Sikorsky Aircraft Division

LAKE ERIE ENGINEERING CORP.

General Offices and Plant
507 Woodward Avenue, Buffalo 17, New York

District Offices in NEW YORK • CHICAGO • DETROIT • PITTSBURGH

Representatives in Other U. S. Cities and Foreign Countries
Manufactured in Canada by: CANADA IRON FOUNDRIES LIMITED

HYDRAULIC PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

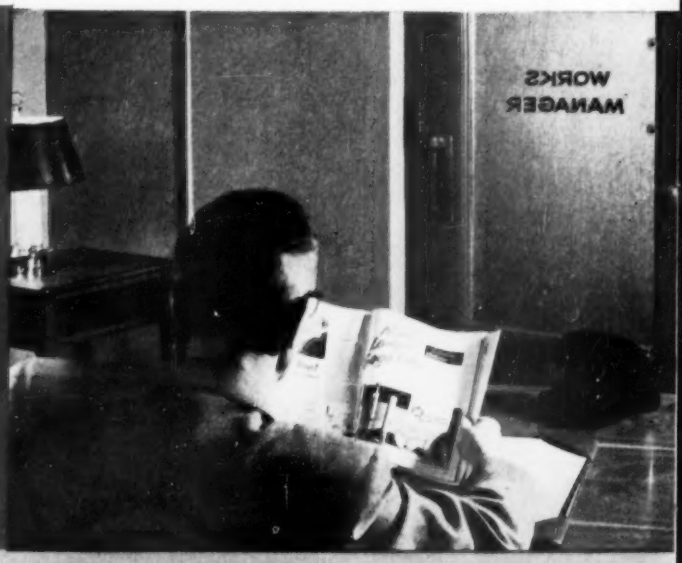
LAKE ERIE

How to make your advertising to

AMERICA'S BIGGEST INDUSTRY
Number of metalworking plants and employees for plants employing 50 or more workers*

	No. Plants	No. Employees
Agricultural machinery	369	204,568
Construction, mining and oil well equipment	438	142,161
Metalworking machinery	902	219,771
Special-industry machinery	846	210,612
General industrial equipment	940	299,435
Office and store machines	182	122,318
Domestic and service equipment	367	204,377
Electrical equipment	1,609	915,542
Motor vehicles and parts	752	743,019
Aircraft and parts	286	483,076
Railroad equipment	81	83,710
Shipbuilding, ordnance and miscellaneous	1,025	490,355
Precision mechanisms	529	221,798
Fabricated metal products	4,152	1,005,122
Miscellaneous machine parts & jobbing shops	450	169,972
TOTAL	12,928	5,515,836

*1952 McGraw-Hill Census of Manufacturers



In Metalworking, with its more than five million workers, almost 13,000 important plants, and $100 billion annual production, it is obviously important to concentrate your advertising to reach and sell the men who have basic buying influence for your products. A lack of such concentration dissipates both your dollars and the sales effectiveness of your advertising.

And because Metalworking's production executives do have this basic buying influence, your advertising works best for you in a magazine which *concentrates* on serving metalworking production management . . . and delivers the coverage and deep penetration of this group which can alone produce maximum results for you at lowest cost.

Metalworking's Capital Expenditure Plans 1953-1956—Millions of Dollars

(Source: McGraw-Hill 1953 Survey of Capital Expenditure Plans)

Machinery other than electrical	$2350
Electrical Machinery	1729
Automobiles	3476
Transport equipment	584
TOTAL	**$8,139**

And this year, with metalworking production at the highest levels ever reached in other than the peak years of World War II . . . and with this industry planning to invest $8.1 billion in expansion and modernization during the next four years . . . your advertising in *American Machinist* has a particularly sales-wise job to do.

What's more, all of *American Machinist*'s sound advertising values are available to you at a cost-per-thousand subscribers far below that of any other metalworking magazine. Here . . . and here alone among leading metalworking magazines . . . you buy the proved interest and attention of an all-paid, ABC-audited circulation, 31,272 strong last December, and now over 32,000.*

*** subject to ABC audit**

Metalworking work harder... sell more

ABUNDANT HELP LIKE THIS FOR OVER 32,000 PRODUCTION-MINDED METALWORKING SUBSCRIBERS

This job *American Machinist* is outstandingly equipped to do. Edited exclusively for metalworking production, this magazine offers you more production engineering and executive subscribers than any other metalworking publication has ever before delivered

. . . which is why over 800 advertisers not only invest more advertising dollars in *American Machinist* than are invested in any other metalworking magazine . . . but also place more pages of advertising here for the machinery, equipment, materials, components and supplies used in Metalworking than are entrusted to any other magazine in the world.

SO . . . when you seek increased sales in the $100-billion Metalworking Industry, and want to build preference for your products among this industry's most important buying group . . . production management . . . the facts will tell you why

This is the No. 1 place to do business with America's biggest industry

THE McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
McGRAW-HILL BUILDING, NEW YORK 36
PUBLISHED EVERY OTHER MONDAY
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS AND THE ASSOCIATED BUSINESS PUBLICATIONS

ABP ABC

LINDNER

No. 15 Jig Borer

Direct-reading Optical System is free from mechanical wear
Readings in .00005"... settings guaranteed accurate to .00015"
Longitudinal and transverse table movements 40" x 24"
Distance between table surface and boring spindle 10"—30", 34", 38"
Boring spindle speeds infinitely variable from 50-1900 RPM
Maximum boring diameter from the solid 1 19/32"
Maximum boring diameter 10", diameter of milling cutter 5"

Model 14 with 24" x 16" table movements also available

Write for literature and complete specifications

4 weeks delivery... subject to prior sale

KO CO. INC. INDUSTRIAL IMPORTERS

KURT ORBAN

COMPANY, INC.

205 East 42nd St., New York 17 • 1256 East 12th St., Cleveland 14 • 18627 James Couzens Highway, Detroit 35
1939 Santa Fe Ave., Los Angeles

◀ **TINY GRINDING GRITS**—so small they will fit within the space marking one minute on the face of a small watch—are start of entirely new concept that led to Cincinnati Grinding Wheels.

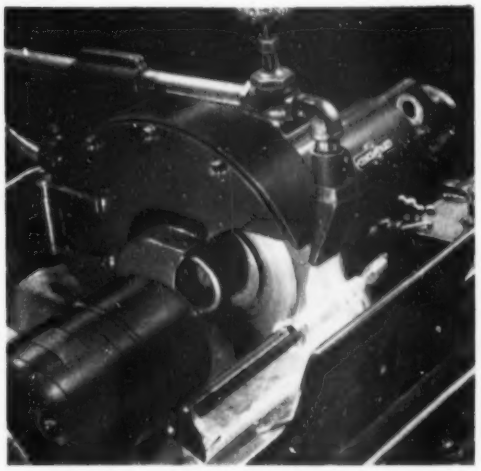
NO BIGGER THAN A MINUTE

The tiny grinding grit is the start of an entirely new approach to grinding wheels. Years of research by Cincinnati Milling has confirmed that the grinding process is a true metal cutting process.

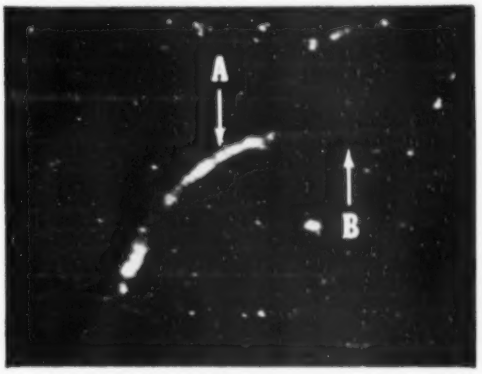
Here is the starting point of development of the grinding wheel as a true cutting tool. Cincinnati Milling has developed and tested CINCINNATI GRINDING WHEELS over a period of several years as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of CINCINNATI GRINDING WHEELS, write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co. Or, if you prefer, write for the free booklet "A New Concept In Grinding Wheels."

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



RESEARCH GRINDING problems have ranged from the grinding of surgical sutures .004″ in diameter to steel mill rolls 60″ in diameter.



GROUND SURFACE OF SAE 3145 steel showing partially formed chip (A) and groove (B) in workpiece from which material of chip was removed.

SPECIAL WORKPIECES shown in picture above, are used by machinist of the research department to compare wheel performance on a centertype grinder.

HARDINGE
ELMIRA, N.Y.

FEATURES...

Infinite Control of Speed and Feed

Tool Room and Production Lathe

Variable Speed Drive for Headstock Spindle

Both drives are independent and infinitely variable to secure every possible combination of speeds and feeds within the following range:

Variable Speeds: 125 to 3000 r.p.m.

Variable Feeds: ¼" to 7" per minute

Write HARDINGE *for Bulletin HLV*

Variable Feed Drive for Carriage and Cross Slide

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol TR Compound

TOOL Heavy-duty tapping machine

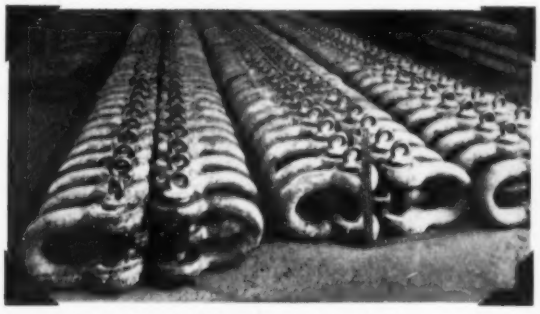
LUBRICATOR Brush and swab

SERVICE Threading 4 inch nuts and shackles

FIRM Schmitt Steel Co., Portland, Oregon

Special tapping compound increases production 43%!

TOOL LIFE INCREASED materially with the switch to Calol TR Compound. Note the excellent condition of this tap. It has threaded 1500 of the shackles and 1500 of the nuts—and is still good for many hours of service. This represents a considerable money saving as replacement cost of one of these large taps is nearly $500. Calol TR Compound also boosted work output. With the better lubrication, the machine could be operated at higher speeds and fewer shutdowns were necessary.

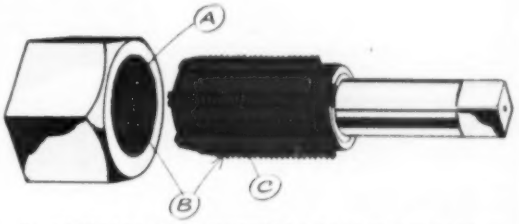


WHEN CALOL TR COMPOUND replaced the usual white-lead-mixture lubricant on 4" taps in the machine at left, defective work was completely eliminated.

Instead of 30 out of every 100 work pieces (big shackles and nuts above) being discarded because of torn or rough threads, all passed inspection.

REMARKS: Besides tapping and reaming, Calol TR Compound is recommended for deep drawing and forming, and difficult metal shaping where ordinary lubricants fail to prevent scuffing or galling. It has the consistency of No. 0 Grease and can be thinned with Calol Cutting Oils.

How CALOL TR Compound ups efficiency in severe metal-working conditions



A. Contains two unusually active extreme-pressure additives—prevents tearing, scuffing, galling of work, promotes good finish.

B. Withstands extreme temperatures—stops welding of tool and work, resists distortion, betters accuracy.

C. Provides good lubrication—allows faster machine speeds, increases production. Easily applied by brush or swab.

CALOL

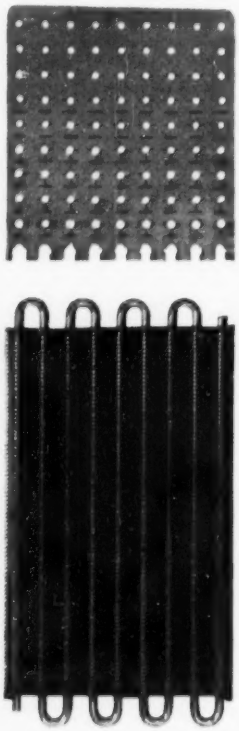
FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

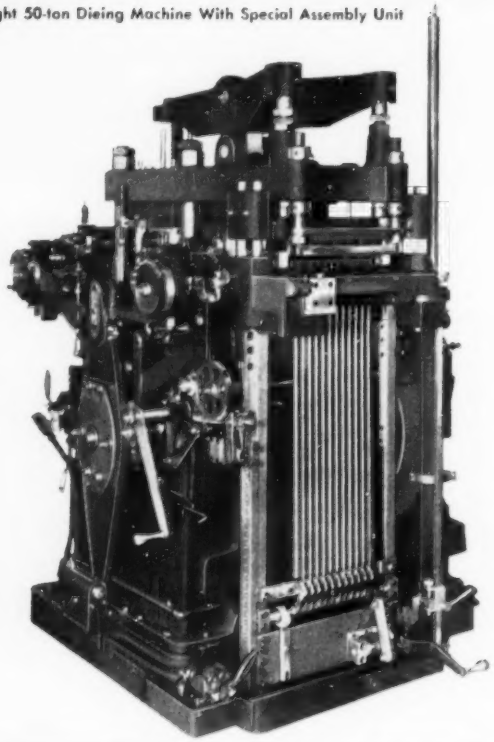
THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

this condenser "assembled for nothing"



Henry & Wright 50-ton Dieing Machine With Special Assembly Unit



Henry & Wright Dieing Machine stamps out fins and then fits them onto tube at high speed . . .

This single Henry & Wright Dieing Machine does the work of several ordinary presses and a benchful of assemblers. First, the fins are partially completed via progressive stamping, at the rate of 120 strokes per minute. Next, the fins are fed onto the serpentine tube, fitted and cut off from the strip. The operator simply removes completed core and puts a new tube in the assembly fixture.

Combining high speed with long die life, the Henry & Wright Dieing Machine provides a production tool basically designed for new and improved methods. From simple blanking to complex operations, you can count on a price cut with every stroke.

LATEST CATALOG

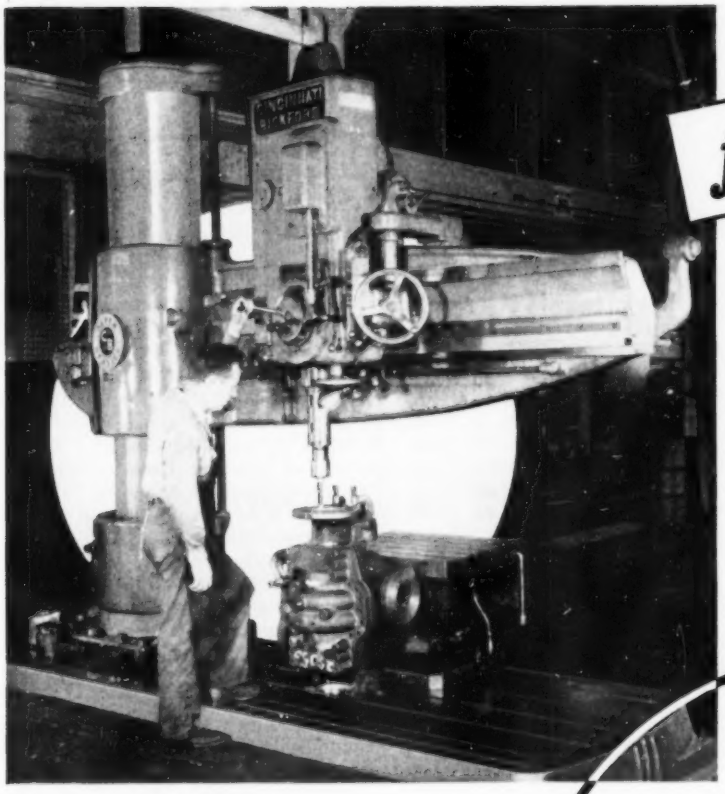
See how you can use Henry & Wright Dieing Machines to modernize your operations. Write Henry & Wright, 481 Windsor St., Hartford, Connecticut.

Only the best is good enough

HW

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

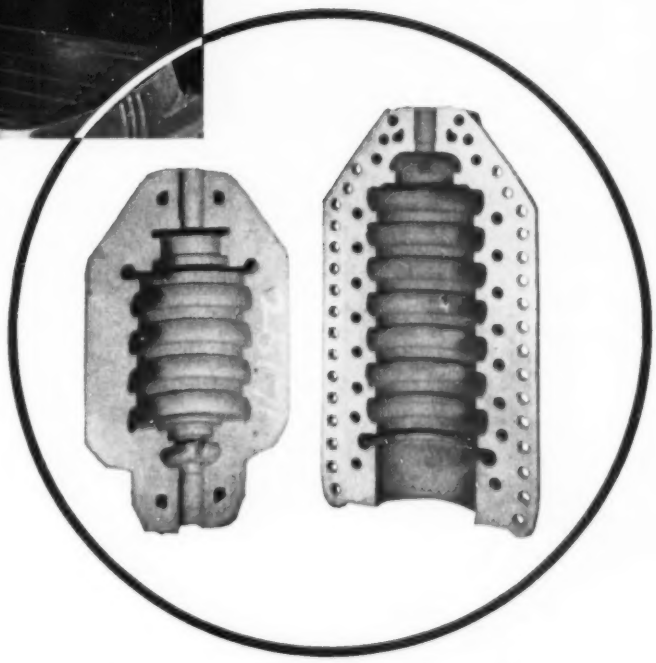


Photo—Courtesy Pacific Pump, Inc.

faster and easier... machine performance

Pacific Pump, Inc., say maximum production is the result of the faster, easier controls and fine balance of our 7′ arm, 19″ column Cincinnati Bickford Super Service Radial Drill. Here centrifugal pumps for process industries, utilities, and marine power plants, are being drilled, tapped, and spotfaced with speed and economy. Cincinnati Bickford Super Service Radial Drills will bring you too, maximum productivity at low cost.

Write for Booklet R-29.



Half shells for a centrifugal pump—approximately 100 holes are drilled—half of which are also tapped.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

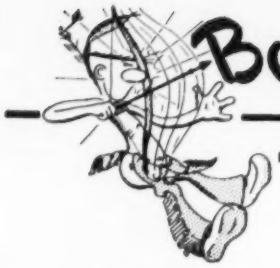
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

...SAME
HIGH QUALITY
REAMERS
L & I's broader range of high quality STANDARD reamers has met with overwhelming acceptance. Ask your distributor for latest information on L & I's quality plus . . .
...NEW
LOW PRICES
LAVALLEE & IDE, INC.

L&I *The Reamer Specialists*

LAVALLEE & IDE, INC.
CHICOPEE, MASS.



Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Tool Troubles

First-class machinists' tools are expensive, but you have to have them to do a good job. At one place I worked, the company had a little store where you could buy all kinds of tools at a very good discount. They also sold the company's product at a discount to employees. In my present job I need some new tools, pretty expensive ones, but they tell me I have to buy them at a local store. I asked the company buyer if he couldn't get them for me in the company's name and thus get me a discount, but he said it was impossible. Yet I know the company buys such tools for its own use. Is it asking too much that they get tools for employees, too? In these days of high prices it would be a real help and would be a good piece of employee relations.

Herbert Rowntree
Cleveland

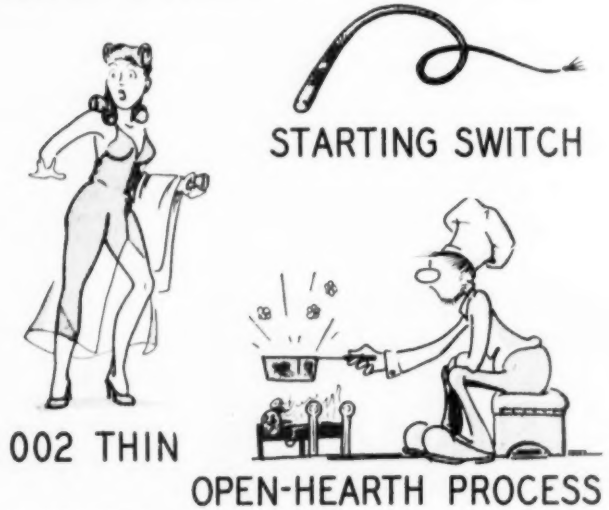
Grinding Chips

While it is difficult to say which branch of metal cutting has shown the greatest advance since I first went into the shop in 1883, it seems to me that grinding probably heads the list. This may be because our grinding equipment consisted mainly of a grindstone for sharpening lathe and planer tools, and a toolpost grinder for renewing the cutting edge on some special reamers. The toolpost grinder came after I had been in the shop a few years. In fact I sketched it and made one for the carriage of my 13-in. Blaisdell lathe. The wheel was 6 in. in dia by ½-in. face, driven by a small round belt from an overhead drum. The shop next door had a regular cylindrical grinder. But both this and my toolpost grinder reminded me of Fourth-Of-July pinwheels when at work. Sparks rather than metal removal, was the main result from both.

Research since that time, by makers of grinding wheels and grinding machines has completely changed the picture and put the grinding machine in the metalcutting class. Reports from Cincinnati Milling Machine Co show clearly that the grinding wheel is a real cutting tool that produces real chips. We used to think of it as process for "worrying" small particles of metal until they finally decided to part company with the piece itself. Now we know that each grain of abrasive is really a small cutting tool that cuts a chip, and that the

GRINETICS

By D G SMITH



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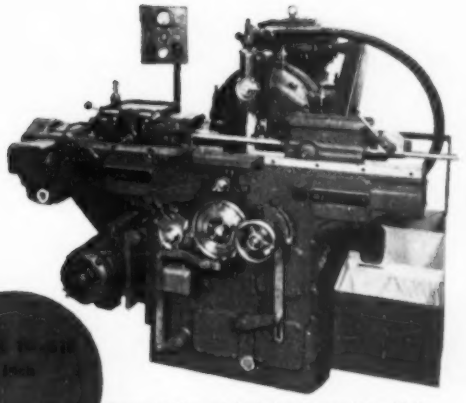


Quality threading
AT MINIMUM COST

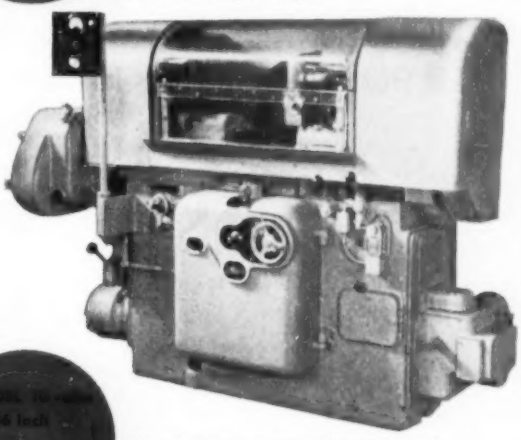
JONES & LAMSON
AUTOMATIC THREAD GRINDERS:

- Produce threads of better quality and more uniform finish
- Reduce handling cost
- Eliminate costly rethreading after heat treatment
- Eliminate expensive retooling when specifications change
- Reduce cost of gage maintenance

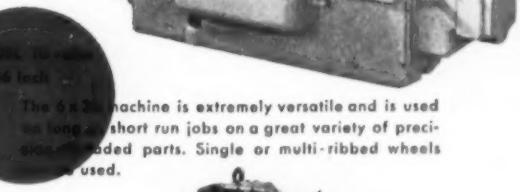
Built-in accuracy and automatic features, make any of these machines a paying investment for toolroom or production line.

- Automatic wheel truing
- Automatic infeed on successive cuts
- Automatic sizing
- Rheostat wheel speed control
- Diamond or crush dressing of wheels
- Multi-ribbed threading
- Right and left hand threading

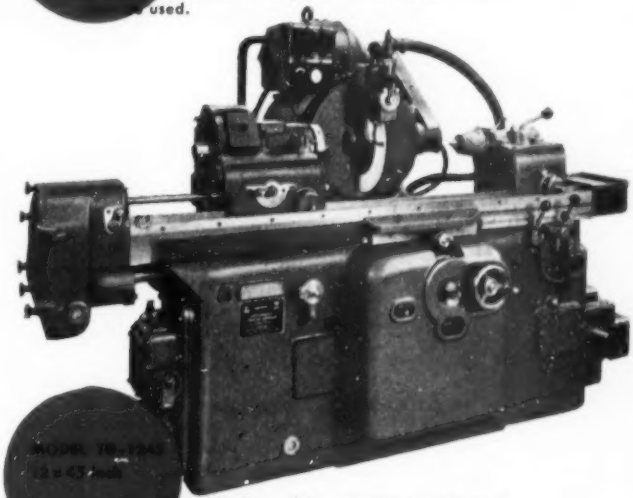
When measuring the value of a thread grinder remember the extra benefits of J & L top-flight construction. Write Dept. 710 for illustrated catalog.



The 6 x 12 Automatic Thread Grinder is used for high production thread grinding with either single or multi-ribbed wheels on relatively small parts.



The 6 x 24 machine is extremely versatile and is used on long and short run jobs on a great variety of precision threaded parts. Single or multi-ribbed wheels can be used.



The 12 x 48 machine is used for grinding threads on a wide range of work from small to large heavy parts. Single or multi-ribbed wheels can be used.

JONES & LAMSON

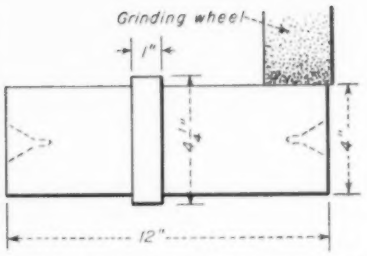
Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. THREAD GRINDER DIVISION

permanently roll-marks graduations and figures into steel, aluminum or cast iron dials and collars

This new Noblewest precision graduating machine combines the roll-marking process, originated by NOBLEWEST, with electropneumatic control. Permanently roll-marks graduations and figures into dials and collars up to six inches in diameter and automatically compensates for slight variations in work diameters. After initial set-up, operator is required only to load . . . push a button . . . then unload. Depth of mark is controlled by pneumatic table pressure plus the number of die and work revolutions. This machine is extremely compact . . . requires only 20″ x 24″ floor space. For detailed information on how Noblewest Marking Machines, tools and dies can lower your production costs, write The Noble & Westbrook Mfg. Co., 17 Westbrook St., East Hartford 8, Conn.

Noblewest Model 50P-336 shown tooled for precision graduating.



abrasive wheel is a real cutting tool with many cutting faces.

The first one to bring this to my attention was John Bath, whom I first met when he was foreman for Amos Brainard, building milling machines in Hyde Park, Mass, before the turn of the century. After he began to build grinding machines, many years ago, he showed me some real chips produced by the abrasive particles in the wheel. Since then others have greatly advanced the art of grinding. I am, however, reminded of a demonstration on a Bath grinding machine built for him by the B D Whitney Co, Winchendon, Mass, about 1912.

I did not see the test but it was witnessed by his son Chester. A 4½-in. bar of steel 12 in. long was turned to a 4-in. diameter on each end leaving a collar 1 in. long and ⅛ in. high in the center. The wheel was fed in to the 4-in. diameter, then traversed to remove the collar at one pass.

I also recall the almost unbelievable amounts of metal removed by the Blanchard machine when Winslow Blanchard was still at the helm. This in no way detracts from the value of later research. It merely shows that men have been thinking along these lines for more years than we realize.

Fred H Colvin
Point Pleasant, NJ

Misunderstanding

Regretfully, we must register a complaint concerning a recent news item (*AM*—July 6, '53, p99). In the first paragraph you state the cancellations have been largely on the basis of weeding out the high-cost second-source producers. Your second paragraph states, "The Kaiser Motors contract was just an example. But there have been others too. TEMCO of Dallas was dropped as a second-source producer of McDonnell's F3H *Demon* Navy Fighter."

The above would certainly give the impression that we are a high-cost producer, yet the facts are, as printed in *Aviation Week*, that TEMCO is producing at a cost which is less than half the industry average.

When our president, Mr McCulloch, discussed the termination in person with Charles E Wilson, Mr

Wilson assured him that it was in no way to be interpreted as a reflection on TEMCO but was strictly a matter of reduced requirement for the aircraft involved. We are particularly concerned with this, because the item appears to group us with Kaiser.

Sydney H Carter
Temco Aircraft Corp

The juxtaposition was unfortunate: Temco's excellent cost record is, indeed, a matter of public knowledge. —Ed

•

Plant Frills

The description of the Duncan plant (*AM*—July 20 '53, p119) was especially interesting to me as an old timer who was in the shop when buckets were standard equipment for wash rooms and we worked with mittens and overcoats until the shop warmed up on cold mornings. And even then it never got too warm.

It may have been economical at that, as the wages were then 25 cents an hour for machinists. There was no night watchman or engineer to have the plant warmed by 7 AM. The only thing it lacked to be really tough was what the boys called "outdoor plumbing."

Those were the days when workers were supposed to be thankful for any kind of a job. One of the largest plants in Philadelphia forced the men to walk past the cashier's window, outside his office, to get their pay envelopes after giving their name and number. Rain, snow, or sleet made no difference. The guy was supposed to be thankful anyhow.

Both men and management have benefited greatly since management realized that workers are as necessary as machines, in spite of automation and lesser improvements. One manager of a highly mechanized plant told me a few years ago that he would much rather lose his plant than his workers.

The use of cubicles for some operations should have a bearing on one of the recent Round Table discussions. Even the powder room probably pays off. Such a plant attracts the best class of workers and usually does not have too much trouble in keeping them.

It probably goes without saying that the Duncan Electric Co has a modern incentive system as well as other methods to foster cooperation and loyalty. These count in any type of business and are reflected in the balance sheet.

Fred H Colvin
Point Pleasant, NJ

Increase Output . . . Lower Costs
with
OLIVER ACE
Universal Tool and Cutter Grinders

The OLIVER ACE gives Guaranteed Accuracy!

Direct Reading for Clearance
—Reduces Fatigue
—Eases Operators' Jobs

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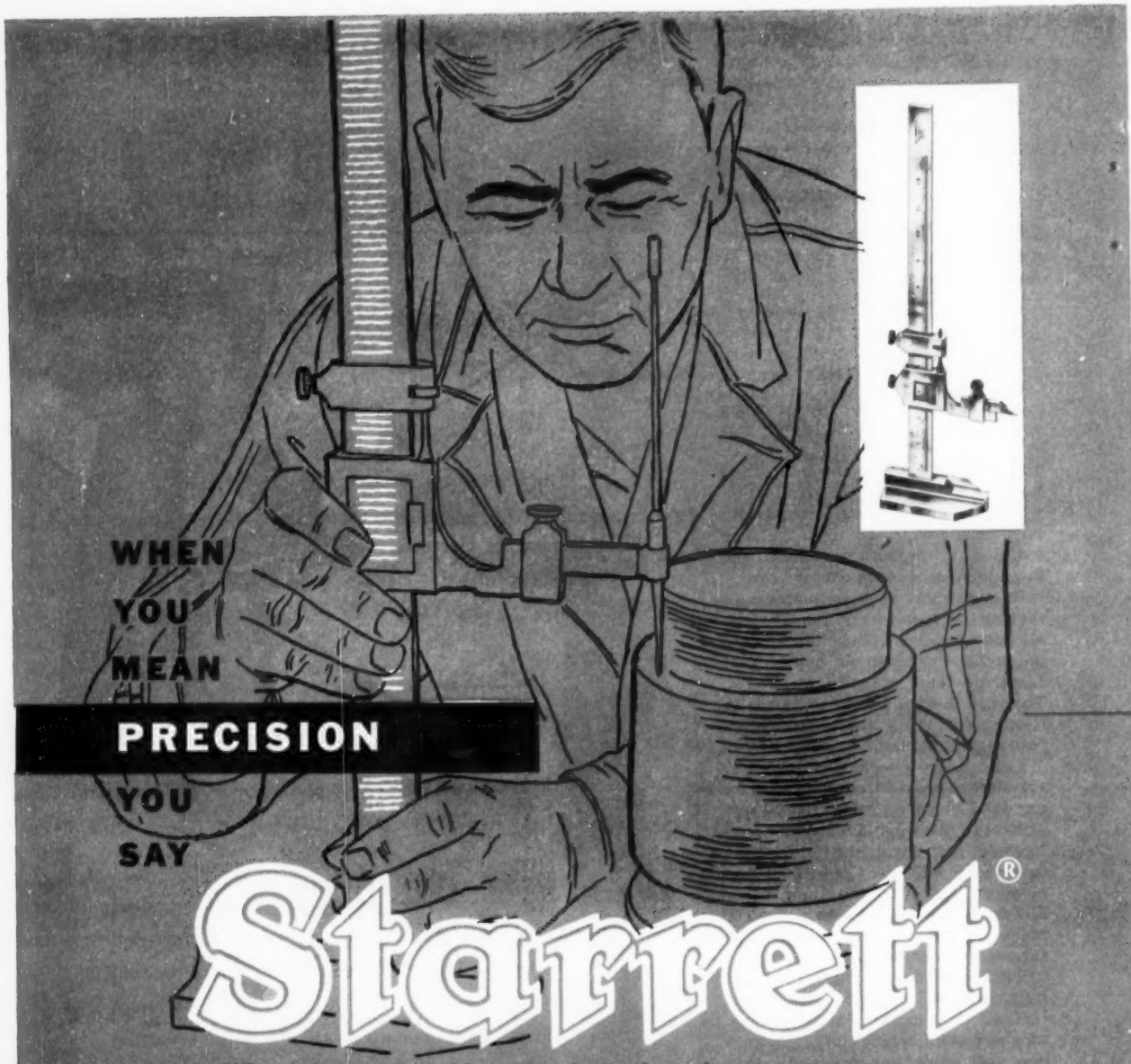

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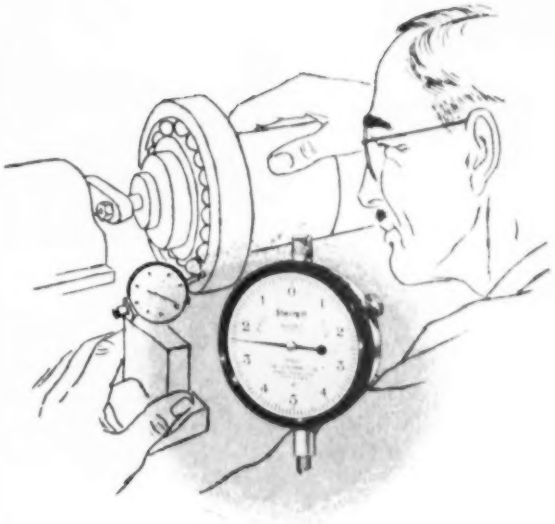

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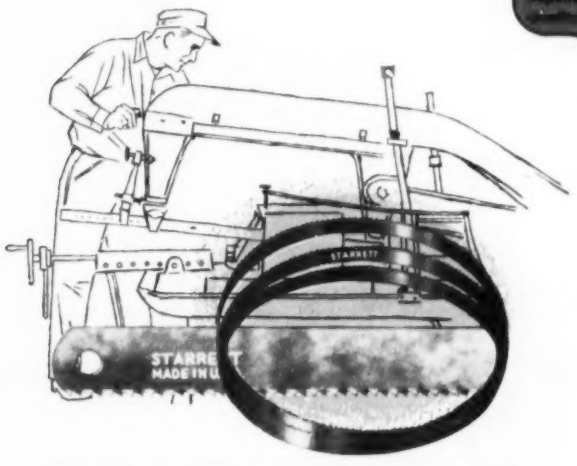

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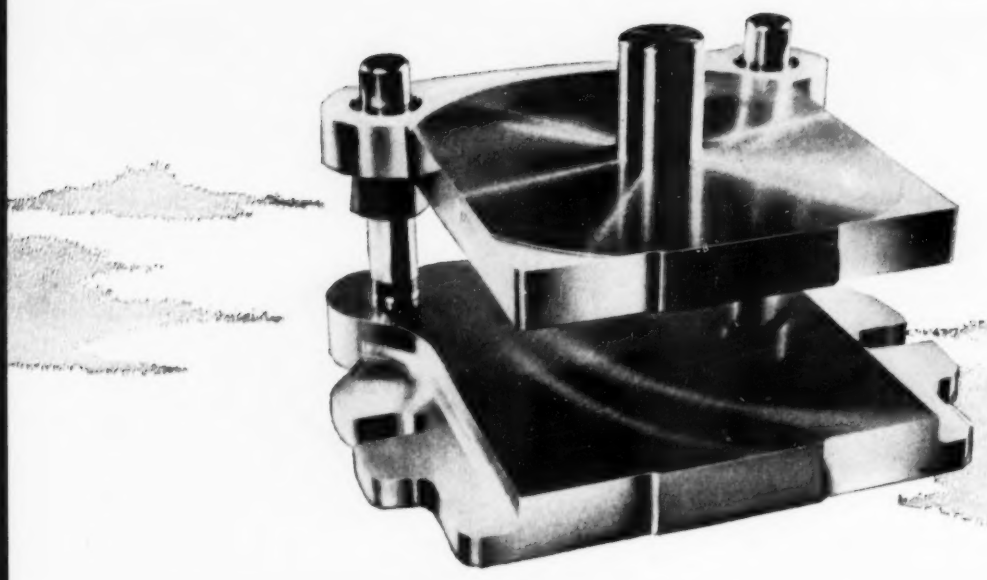

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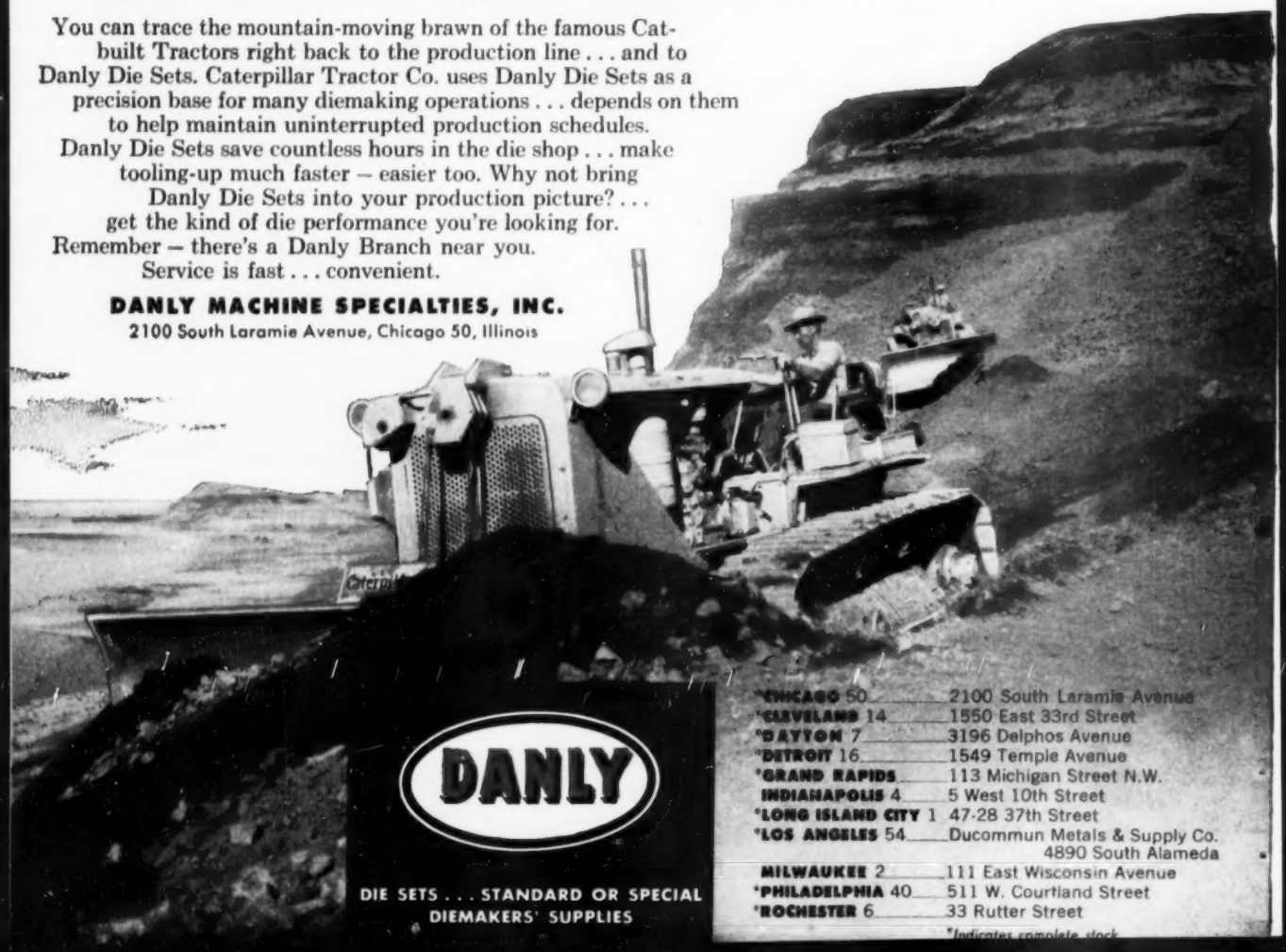

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*Indicates complete stock

SPOT NEWS of Metalworking

- **Use of Oerlikon (Swiss) patents in armament manufacture** has been secured by Japanese Nippei Industrial Co which will employ Oerlikon production techniques. Some 20 Swiss-Japanese technical cooperation contracts have been signed since 1946.

- **Cost to the Air Force of cancelling one of its big presses** is likely to be around $5 million. Talk is that the press could have been completed for $2 million.

- **Dual-purpose plants were ranked with Pentagon reorganization as imperative** by Defense Secretary Wilson in discussing his program with new defense civilian officials at Quantico recently. He regards the Buick-Oldsmobile-Pontiac factory at Kansas City as the model dual-plant operation. He hopes to build mo e plants like it.

---

80 machine-tool production packages, representing half the $615 million of machine tools now in tank and vehicle production, will be deactivated by Army Ordnance. Under this plan, Ford could get back into full tank production within 18 months or in half the time required after Korea. For detailed story, see page 145.

- **A new plastic sheet that can compete costwise with steel in light structural work** is being marketed. It is easily machined, is dimensionally stable, requires no heavy presses or expensive dies or machines for forming. It can replace fabric in applications in which the fabric serves as a liner. Prototypes can be produced in weeks instead of months without heavy machine investment.

- **Automotive Big Three are producing today 93% of total passenger car output.** General Motors has 46%, Ford 27%, Chrysler 20%. Ford plans to build many more cars and trucks the last half of this year than the first half, when it turned out 786,000 units. Ford's best year was 1950, with assemblies of 1,902,000 vehicles.

- **Important West-Berlin machine tool builder who employed 3200 workers a year ago** is down to about half that number today, reliable reports say. Sales have plummeted in recent months. Entire West-German machine tool industry is operating on much smaller scale than in 1952.

- **Czechs are replacing their standard cars and trucks with new models.** Since 1950, that country's nationalized auto industry has produced only three car types, two truck types. Designs are being scrapped in favor of heavier models.

Any slowdown in metalworking, if it comes, will give shops a long-needed chance to make a thorough check of production equipment. For example, production line heat-treating furnaces will get a hard look for repairs or, more likely, replacement with more efficient equipment. There is today a trend toward installing furnaces that will get out the required volume of work in one shift, so that the plant owner need not supply personal or hired supervision during a night shift.

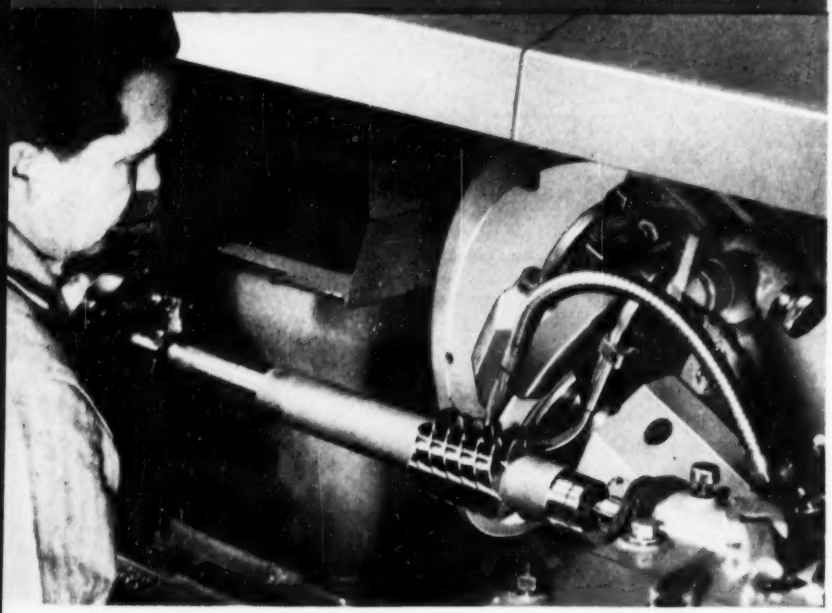
- **Defense orders make up 50% of tool and die shop volume in only four areas:** western Massachusetts, 90%; central Connecticut, 80%; Los Angeles, 75%; Cleveland, 50%. Detroit's defense tooling has dropped to 2% of volume.

- **A White House leak on Presidential Taft-Hartley revision intentions** has T-H supporters up in arms. Proposed message to Congress contained 19 points — only one favorable to management (no bargaining during the term of a contract). Omitted were a reorganization plan for NLRB, and free speech rights for employers. White House says message wasn't even in semi-final stage. Anyway, T-H amendment fight has been shelved until next Congressional session.

Grinding 5-Start Worm with 4" Lead

STANDARD STYLE 36

EX-CELL-O Precision THREAD GRINDER



In the photograph at the left the operator is grinding a worm shaft for use in a special machine. The part is about 22" long and the worm is 4½" long, 3.430" O.D., has 5 starts, a pitch of .800", a lead of 4" and a tooth depth of .5454". The worm was ground in two operations on a standard Style 36 Thread Grinder. It was rough ground from the solid, hardened, then finish ground.

For complete information and specifications on the Style 36 and other Ex-Cell-O Thread Grinders contact your local representative or write today to Ex-Cell-O.

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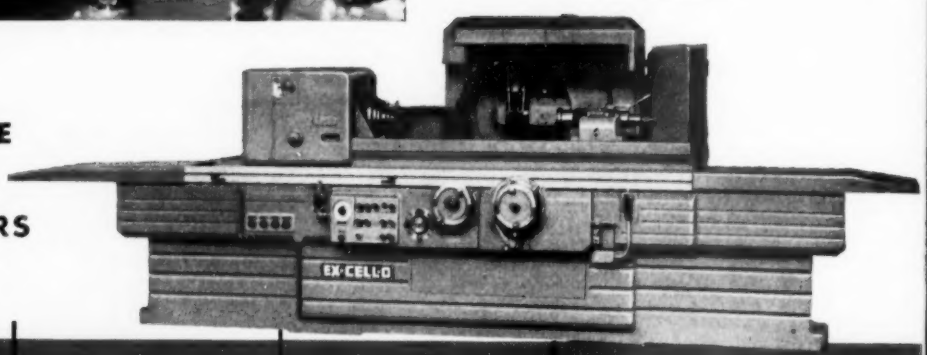
A COMPLETE LINE OF PRECISION THREAD GRINDERS



STYLE 30
Precision Thread Grinder—a versatile machine for external work, also available with internal attachment.

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Precision Thread Grinder—a versatile machine for extra long external threads, available with internal attachment.

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53-35

Washington

The Vance Plan fund for reserve tools and facilities was squeezed down to $250 million in the Defense Department appropriation finally passed by Congress. That's half the sum requested by both the Truman and Eisenhower administrations and half the amount voted earlier by the House. Up to $50 million can be used to buy private plant facilities the Pentagon might want to keep on standby.

There was no sleep lost at the Pentagon because of the 50% budget cut. The Vance Plan fund had been pushed by ODM and NPA, not by Defense Secretary Wilson. In fact, it was Wilson's lukewarm support for the fund that prompted the Senate to make the cut.

In his plan, Vance proposed that $500 million be spent for reserve tools in the first year, then similar or even larger sums in later years. Congress put no time restriction on its $250-million appropriation, so the money is good indefinitely. Since Wilson still has no ideas for early use of the fund, it's not likely that there'll be big sums of new Vance Plan money appropriated next year.

Besides, Congressional language accompanying the appropriation virtually ordered the Pentagon to lump Vance Plan money in one fund with the still-unobligated portions of the over-$6 billion appropriated since Korea for defense plant expansion. Unobligated money now totals $600 million—most of it had been ear-marked for machine tool purchases. Now the Air Force has gotten Wilson's OK to use about $35 million of this money for non-machine-tool end products.

• • •

Renegotiation got stalled in Congress. Last-minute Senate amendments that would have upped the minimum on renegotiable business from the present $25,000 to $50,000, coupled with attempts to modify the standard commercial item exemption, stalled Senate action on the one-year extension after the House had already voted the bill.

Extension now hangs over until next session. Odds are in favor of some extension of the act. Reason is that the present act expires on December 31 and the Excess Profits Tax goes off in January. Congress isn't likely to let both of these checks on excessive profits go by the board.

Feeling of Senate Majority Leader Knowland is that the act can be brought up again in Congress and made retroactive to cover the period after December 31. Chief reason why the Senate took no action was that Sen Douglas (D-Ill.) made a stand on the Senate floor, calling for tabling the act until further hearings could be held and some of the "loopholes" plugged. Douglas feels that the machine tool exemption and the standard commercial item exemption leave the Act weak and ineffective.

• • •

There's more Washington agitation for a new merchant ship construction program. Under one proposal, shipowners could turn in 10-year old tankers on new high-speed, larger-capacity vessels built by the government. It would be much the same as a used car deal, with the private operator paying the balance between the assessed value of the old ship and the cost price of the new one. The government would then take the old tanker, put it in first class shape, and retire it to the mothball fleet.

The program would mean more work for both new construction and repair shipyards, now caught in an economy bite. Presumably the same idea would also be extended to dry-cargo carriers and passenger ships at a later date. Result would be a permanent government floor for the shipbuilding industry. Congress is interested but not enthusiastic about the proposal.

• • •

Some reshuffling of CIO seems in the offing. Never since CIO was born with the New Deal has there been such ferment in labor's inner circles. It could mean the end of CIO, just as New Dealism has faded.

Smack in the middle of it all is John L Lewis. He has been talking with the heads of two large and powerful unions—Steel Workers' David McDonald and Teamsters' Dave Beck.

What are these men up to? Lewis left the AFL in 1935 to build CIO around his miners. He quit CIO after backing Willkie in 1940. After the war he returned to AFL, then walked out again, not wanting to comply with T-H.

A new labor federation is not being planned, despite rumors. Lewis might return to CIO and with Steel Workers, displace CIO's Walter Reuther. Both hate Reuther. More likely: Steel Workers may quit CIO. Either shift would tear CIO apart.

Lewis might return to AFL a second time, with Steel Workers. This would give Beck more power. Lewis and Beck want to undermine influence of new AFL Chief George Meaney.

• • •

Senator Taft's death could make a big difference in what happens to the Taft-Hartley Act, stalled by Congress until next session. Without Taft's steadying influence, the Congress-White House rift on T-H revision could expand to a point where there will be no amendments at all next year.

UNQUESTIONED AUTHORITIES in THE TOOL ROOM . . .

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Precisionaire Internalchek—checks holes .120" up to 1" in diameter—amplification 10,000 or 20,000 to 1. ☐

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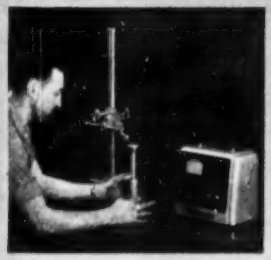
New Sheffield Airetest Indicator—repetitive readings from any direction—ask for a demonstration. ☐

N-6 Electronic Internalchek—checks I. D.'s from .250" to 12"—most widely used of all internal checkers. ☐



Electronic Height Gage—vertical range 18", amplification 1,000 to 1—new toolroom surface plate accuracy. ☐

Electronic Horizontal Externalchek—12" capacity, 1,000/2,000 to 1 amplification. It's new but proved. ☐

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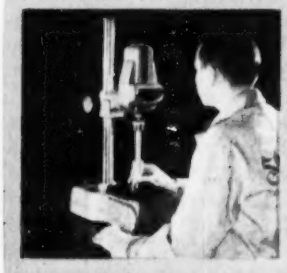
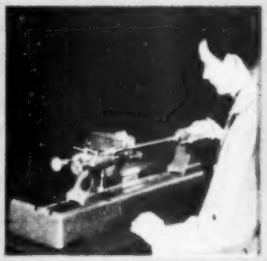


Tool Room Visual Gage—amplifications 500, 1,000 and 2,000 to 1—most versatile and foolproof comparator. ☐

High Amplification Visual Gage—5,000 and 10,000 to 1 amplification—ideal for gage checking in the Tool Room. ☐

Floating Carriage Comparators—diameters and P.D.'s up to 14"—quick, accurate checking of cylindrical work. ☐



Type TS Leadchek-capacity 18" in length, 8" in diameter—checks lead of internal, external and taper threads. ☐

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Detroit

Kaiser Motors Corp has plans for Willow Run, but they are contingent on arriving at a more workable contract with the CIO United Auto Workers Union.

Plans indicate Willow Run would become not only an assembly point for Henry J and Kaiser cars, but also a manufacturing center for those and for Willys vehicles as well. The likeliest bet is that the stampings and body work for Willys would be moved into the big press plant at the former aircraft factory. Another good bet might be that Kaiser will someday go into manufacture of its own transmissions. Some broad hints were thrown in this direction during the recent Warner gear strike at Muncie, Ind.

Operations of Kaiser and Willys are fast being consolidated in the wake of the merger. A lot of clerical and office detail has already been put together; now the program is to find where manufacturing can take over some Willys components now made outside. Meanwhile, engineering is busy working on broader interchangeability of parts between the three lines of cars.

And don't be surprised at whatever Willys does next. With news that it is going into production of television transmitters, auto people are wondering what new production tangent Willys may next explore. The company says it has no plans to enlarge its product offerings. Nevertheless, it is in a most favorable position to branch out, if it chooses. Its foundry division, aluminum forge plant, drop-forge facilities, aircraft-engine division and other properties give it the facilities and capacities to venture into any number of new fields.

• • •

Who's complaining the least about this year's decline in used-car prices? Strangely, the very group one might expect to hear making the biggest noise is among the most silent: The National Used Car Dealers Association. NUCDA, of course, is not elated over sagging prices. However, the corollary effect of the market break —driving the hip-pocket operators out of business—is offsetting some of the sting of lost dollars. NUCDA officials say that there were about 20,000 used car dealers nationally last November. By next November, they expect to see about 15,000 survivors. Most of these, officials reason, will be substantial, honest businessmen who will return a measure of respectability to a field the public has come to distrust.

• • •

Steel bars in the large sizes are still the toughest item in the product mix to get. Some specialty suppliers have been driven, in order to satisfy their customers, to the lengths of buying billets and having them forged down to required sizes.

The reason for the shortage is the Army demand for shell stock in those larger sizes.

Sheets, say automobile purchasing men, are easing up—in large sizes as well as small.

• • •

One or two hundred dollars may seem like too much to pay for power steering, but Kaiser Motors Corp says 78% of American motorists are willing to shell out heavily for the auto appliance. A consumer study reported that about one third of the motorists interviewed indicated they are willing to pay $150 or more for the extra equipment. Another 45% said they would probably ask for power steering if the cost were $100 or less. (Lowest-priced units currently on the market are more than $20 above that.) Of all those interviewed, one out of every five was mildly critical of power steering. Largest objection: Drivers tend to oversteer.

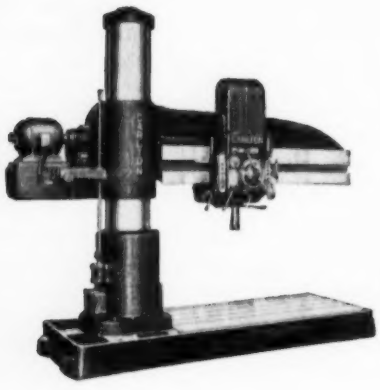
• • •

Success story: Detroit's big auto and auto-allied companies quite naturally make most of the important industrial news. Now and again, a relatively small company like Ajax Mfg Co does more than enough to warrant calling attention to it. Ajax began manufacturing small machine tools in 1945. Company officers soon recognized the pent-up demand for autos, and moved into the auto-accessory field. Among items it has produced: side-view mirrors (5 million of them), nameplates, and hood insignia. Volume with one customer alone now exceeds $1 million annually and the company's production time is committed through all of 1954.

But most important was the view the young firm took toward cutting costs. Cost of one machine for plating parts was $150,000. So Ajax turned to its own engineering staff and, in five months and for $70,000, the company had built an automatic machine for plating parts. Served by an overhead conveyor, the machine is 68 ft long and is designed to plate copper, nickel, and chrome on zinc dies. It is operated by only two employes—one to feed and unload the conveyor, another to attend the machine—whereas Ajax's other unit requires the attention of 12 employees. Additionally, it doubles the capacity of the previous machine. Result: Labor costs on this particular process have dropped by five-sixths; output has doubled; and half the purchase price of the unit was saved by building the machine, instead of purchasing it elsewhere.

Only ONE can be called the Finest: Carlton

. . . here's another good reason why: low maintenance cost



CARLTON RADIAL DRILLS cost less to maintain because they are *designed for less maintenance attention.* For example: there's only *one* friction clutch to adjust. There are *no* tapered gibs to adjust because the head travels across the arm on hardened steel ways. Automatic lubrication throughout eliminates the damage and unnecessary wear that occurs in ordinary radial drills.

COMPARE CARLTON AND YOU'LL BUY CARLTON. Judge for yourself why Carlton radial drills are the first choice of American industry. Write for bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Machine Tools

Washington developments are conspiring to delay or cut down the defense purchases of machine tools during the remainder of this year and perhaps for an indefinite period.

High officials think privately that the defense program is bound to be curtailed a lot the next year, barring the flaring up of war again in Korea or an outbreak of fighting elsewhere.

The defense budget, for the immediate future and for the longer stretch, is believed to be unrealistically high.

• • •

Not much if anything will be done in planning for future defense tooling and production until the new Joint Chiefs have come up with their program for future military requirements.

The story is that they are not willing to accept the judgment of the Joint Chiefs that have retired from office. They wish to make their own studies and arrive at their own decisions.

• • •

It will be at least the end of 1953 before the new Joint Chiefs formulate a program of what kind of weapons they want and how many of them.

That particularly goes for the long-range planning involved in carrying out the Vance Plan of a broad mobilization production base.

Though Congress has voted $250 million for long lead-time machines and facilities, as a beginning of the Vance Plan, no actual orders will be placed until the Joint Chiefs make up their minds what they want.

• • •

Pentagon has won out in the bitter dispute over the Central Inventory of idle machine tools owned by government agencies. Technically, the Central Inventory is to be abolished.

The armed services are to take over management of the machine tools that they own. The Department of Commerce is to have charge of surplus machines from all other agencies.

The truth is that this action means that Pentagon will have jurisdiction over all but about 400 of the surplus machines.

Some of the Commerce Department people view this division as a bit silly and wish that Pentagon had been given all the surplus machines, as long as it was getting most of them.

• • •

The leasing of surplus machines is an idea that seems to have taken hold in the armed services.

Army Ordnance has announced that it intends to lease machines in surplus "production packages" from idle tank and military vehicle factories. Leasing will be restricted to defense contractors or their subcontractors who would use the tools again to build tanks and vehicles in an emergency.

The lessees would have the privilege of operating these machines on civilian work.

National Production Authority would like to see the leasing confined to defense-production work. The user would have to certify that the tools are to be employed to produce defense items or he could not lease them.

• • •

The so-called D list of critical machine tools has not yet been revised by NPA.

It is possible that instead of issuing a revised list, NPA may abolish the list altogether. Pentagon, however, might put up strenuous objections to such action.

Nothing is likely to happen to the D list as it now stands during the next 60 days, however.

• • •

Fiat would like to buy some 23 US machine tools costing $1 million. Financing would be done by the Foreign Operations Administration (FOA), formerly the Mutual Security Agency.

Application has been made for priorities to get these machines with the least delay. They will be used to produce Allison jet parts for which Fiat has an offshore procurement contract.

The Air Force threatens to put an end, however, to Fiat's proposition. Jet engine production has been cut back at the Allison plant in Indianapolis, the result being that a number of machine tools owned by the Air Force have become surplus.

Fiat now is being offered these surplus machines on a rental basis by the Air Force, which figures that it thereby will save money.

FOA is not taking kindly to the idea. It claims that its dollars cannot be used for rental purposes. If the Air Force wants to get rental money for its surplus machines abroad, the financing will have to come from other sources.

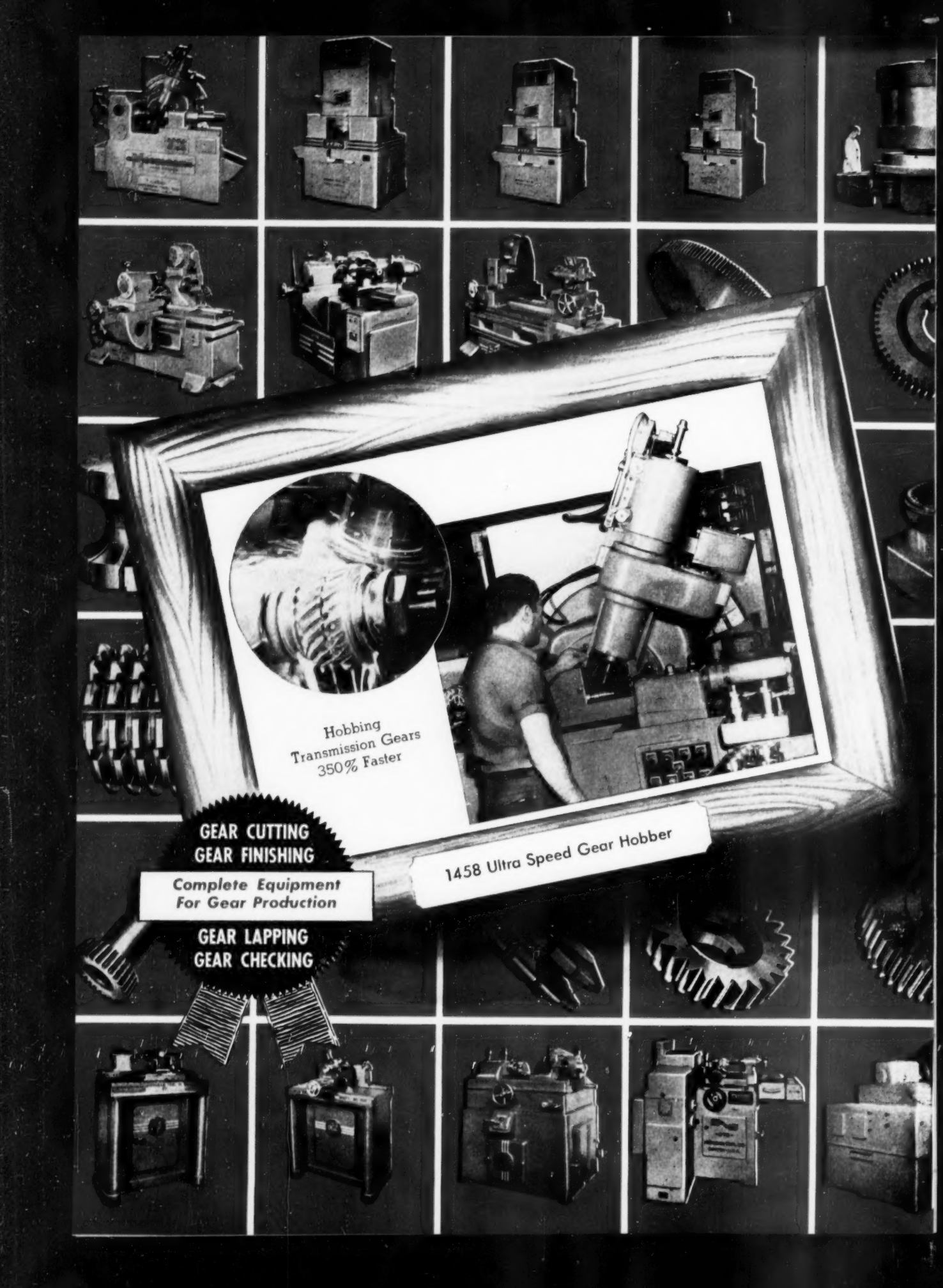
• • •

An eastern lathe builder has received an order for 23 machines costing over $500,000 from the Turkish Commission. The machines are to be installed at the government arsenal in Turkey to be used for turning shell.

Originally some $50 million was authorized to carry out the program. In view of the fact that nowhere near that amount will be needed, the actual authorization is likely to be reduced to $10 million.

G A Gray Co and Onsrud Machine Works Inc are the only two projects approved under the program.

BF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Transmission Gears
350% Faster
1458 Ultra Speed Gear Hobber
GEAR CUTTING
GEAR FINISHING
Complete Equipment
For Gear Production
GEAR LAPPING
GEAR CHECKING

.....headline in Production Engineering & Management January, 1953

"FORD Hobs Gears 350% Faster"

We've checked on it and the editors of PRODUCTION ENGINEERING & MANAGEMENT are right. At Ford Motor Company 3⅛" diameter, 9-pitch, 1⅛" face width transmission gears are being hobbed at a production rate 350% greater per spindle than compared with multiple spindle machines. To do this Ford uses one of the new Michigan Ultra-Speed gear hobbers equipped with double thread accurate unground Michigan hobs. Gears are hobbed two at a time, 58 seconds per pair.

Despite the high output rate, 225 gears are produced per sharpening of the hob. Among the reasons given are that "the machine is of rugged, compact construction, simplified in design, with few gears for the index and main drive and . . . with a maximum spindle speed of 1000 rpm."

Of interest is that better control of surface finish is obtained by easier subsequent shaving. Loading and unloading time is kept to a minimum by hydraulically-actuated expanding arbors. Vibration has been practically eliminated by providing maximum rigidity plus a flywheel to dampen torsional vibration.

For further details, write for Bulletin #1458-52.

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL Company

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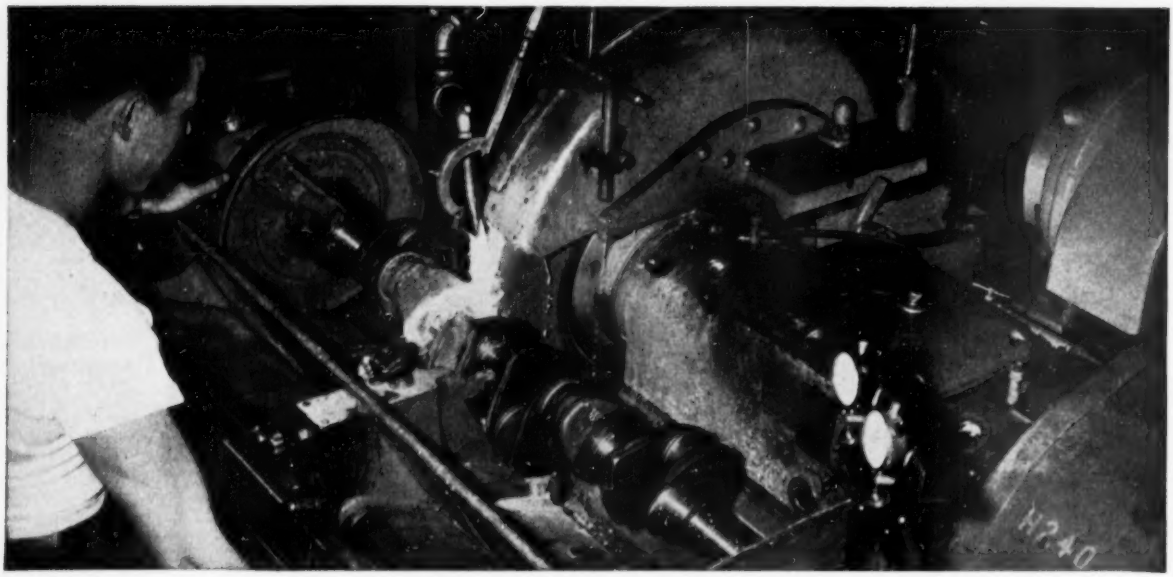
"TEXACO LUBRICATION ENGINEERING SERVICE IS REALLY 'ON THE BALL'"

—Norman Nesbitt, Purchasing Agent, Atlas Crankshaft, Inc., Fostoria, Ohio



ATLAS CRANKSHAFT, INC., takes pride in the fine quality of its products — and whatever helps to maintain that quality is highly prized. That is why Atlas has been using *Texaco Soluble Oil* in its grinders for a good many years — getting fine results in finish, rust prevention, emulsion stability and cleanliness.

But Atlas is particularly pleased with the service that goes with Texaco products. Mr. Norman Nesbitt, Purchasing Agent, writes:

"A Texaco Lubrication Engineer calls on us regularly and confers with our engineers and operators. When, a couple of years ago, our water condition changed, your engineer got together with ours and recommended changing from *Texaco Soluble Oil D* to *Texaco Soluble Oil HW*, to avoid possible adverse effects from increased water hardness. We followed his advice and have continued to get fine results.

"This is the kind of foresightedness in stopping trouble before it starts that makes me say that Texaco Lubrication Engineering Service is really 'on the ball'. We appreciate it, as I am sure your other customers do."

Skilled Texaco Lubrication Engineering Service is famous everywhere. Put it to work in your plant — along with *Texaco Cutting, Grinding and Soluble Oils* — and step up production, reduce unit costs.

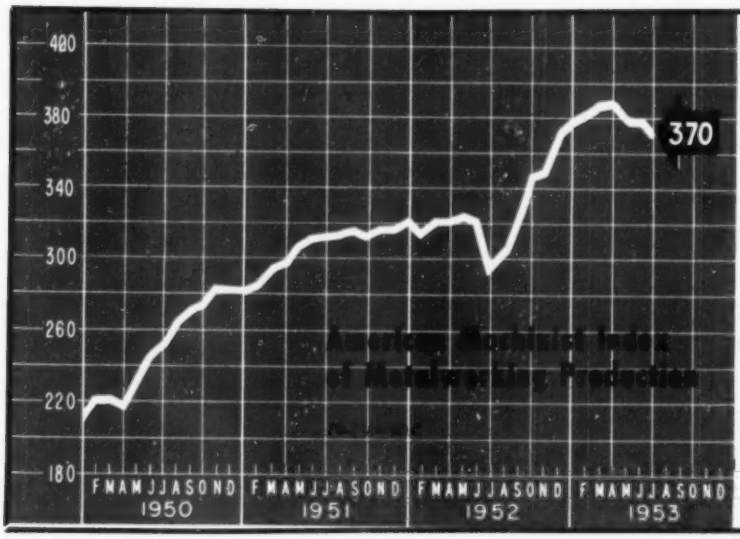
Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY '53(*)	JUNE '53(p)	MAY '53(r)	JUNE '52
Tot. Index	**370**	**379**	**377**	**320**
Machinery	**339**	**339**		**316**
Electrical Machinery	**415**	**417**		**349**
Autos	**329**	**321**		**228**
Other Transportation	**602**	**596**		**538**
Other Metalworking	**369**	**366**		**306**

(*) Estimated (p) preliminary (r) revised

There is no tangible evidence to show that the truce in Korea will affect metalworking operations adversely in the immediate future.

The long-term effect is something else. If defense production is to be cut drastically, it is bound to depress metalworking activities to some extent. But it won't be until late this year or in '54.

• • •

Meanwhile things are a bit spottier than they were. The Big Three automobile makers are doing very well, especially General Motors and Ford. The independents are having some rough sledding.

Home appliance makers are looking hard for sales. So are the farm implement people.

Plane builders insist that they have had no inkling of cutbacks. They expect current production to continue indefinitely.

West Coast metalworking sources report that the truce has had little if any effect on output.

• • •

Switch to a buyer's market is apparent in the intense competition for business in many lines. Some manufacturers, seeking to keep up volume, have made sales at prices yielding only a narrow margin of profit, if any at all.

Many manufacturers have absorbed recent steel price increases rather than push up their own prices.

They call attention to the fact that the steel rise, when extras are added in, comes nearer to $10 a ton than to $4.

• • •

Employment stays at an all-time high since 1944. A surplus of semi-skilled workers is reported, however, in some centers. Example: welding machine and punch press operators.

Skilled metal-cutting machine operators continue to be hard to find. Many companies still are advertising extensively for them in newspapers and by radio.

• • •

Skimpy steel supplies have forced railroad car builders to reduce August operations. September however, will be a different story.

At last count, some 56,000 freight cars were on order. About 35,000 of them are to be built in contract shops and 21,000 in railroad-owned shops. Car-building industry's capacity is 10,000 cars a month.

• • •

Tool and die shops are running as much as 50 hr a week. A strong effort is being made to pare schedules down as closely as possible to 40 hr. Reason: To whittle labor costs.

Chicago area shops have lost some business to outside shops on the basis of higher prices necessitated by new labor contracts. But this is viewed as a temporary condition.

Backlogs in the contract tool and die industry average around 12 weeks.

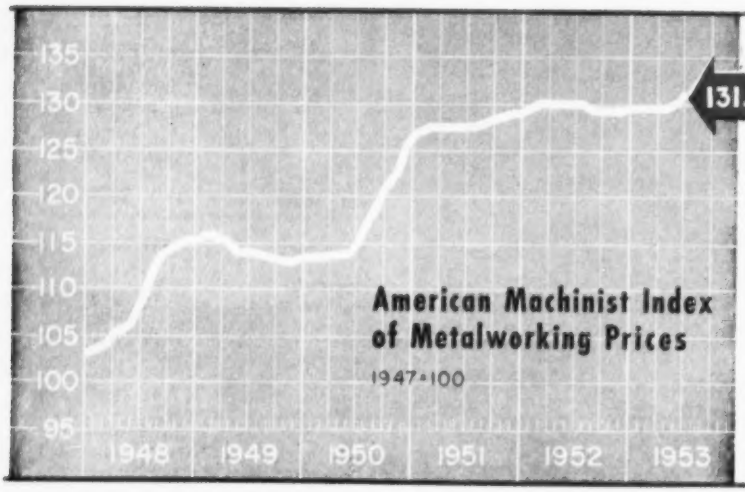
• • •

Steel mills will go into the fourth quarter with satisfactory order books. But backlogs will not be big enough to encourage laxity in selling.

U S Steel anticipates a falling off in operations "on some products earlier than others and at varying times in different parts of the country."

Any immediate drop in steel demand from the military will be taken up by civilian users. That is especially true of flat-rolled products.

Gaging Business



PRICE INDEX

	JULY '53(*)	JUNE '53(p)	MAY '53(r)	JUNE '52
Total Index	**131.1**	**130.9**	**130.4**	**129.4**
Metalworking Machinery	**140.0**	**138.9**	**136.6**	
Other Machinery exc. Electrical	**134.9**	**134.3**	**132.2**	
Electrical Machinery	**129.1**	**127.6**	**124.9**	
Fabricated Metal Products	**127.8**	**127.6**	**127.8**	

(*) Estimated (p) preliminary (r) revised

Industrial production shows no signs of an alarming sag. The Federal Reserve Index was off 9 points in July from June. But this is because there is not enough allowance in the index for a seasonal dip for summer vacations.

Several industries did better in June than in the peak peacetime month (last March). They were: (1) Petroleum and coal products; (2) chemicals; (3) non-ferrous metals; (4) textiles.

Three other industries, by contrast, have been losing ground slowly: Food processing, leather, and rubber production. Rubber is less in demand for tires, as tire makers prepare for a smaller "take" of tires by automobile manufacturers later on.

• • •

Most available business statistics leave one major impression—that things are still pretty wonderful. Retail stores sold $14.7 billion of merchandise in June, or about 6% more than a year ago. Manufacturers shipped 20% more goods during June than in June 1952.

But indicators here and there point to a downward trend ahead.

• • •

Trouble looms on the farm front. Farm income was off 5% in the first half of the year compared with last year. What's worse, the decline in income compared with the previous year has been getting bigger month by month. In June it was down 13%.

Sluggish farm implement sales are the result. Dealers have large stocks and are buying less from the factories. Farm equipment makers have cut production schedules. International Harvester has pared farm tractor output the sharpest since World War II.

• • •

There is little indication of a serious business decline in the remainder of 1953, according to 18 industrial executives reporting to the National Industrial Conference Board. That seems to be the consensus of opinion throughout the nation's industry.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	257.5	259.5	222.0
Steel ingot production (thousand tons)	2,189	2,087	1,866
Electric power output (million Kilowatt hours)	8,512	8,460	7,405
Production of automobiles and trucks	169,690	172,874	22,181
Engineering construction awards (*Eng. News-Record*, millions)	$326.5	$297.5	$253.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	318	367	264
Vacuum cleaners sales (thousands of units)	252	268	217
Washers sales (thousands of units)	287	288	214
Household electric ranges sales (thousands of units)	114	119	69
Radio production (thousands of units)	1,108	1,159	748
Television production (thousands of units)	482	568	309
Foundry equipment new orders index (shipments, 1937-1939 = 100)	294.4	303.0	225.2

* Seasonally adjusted

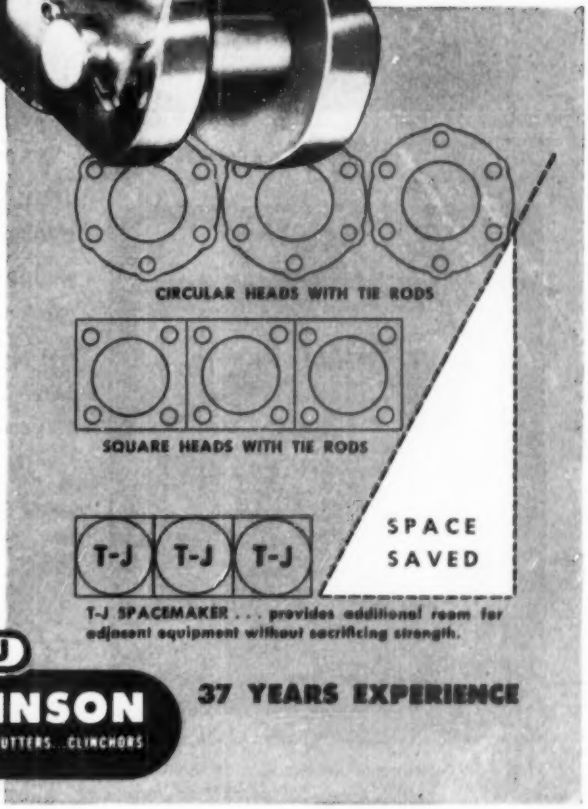
LESS SPACE!

extra high safety factor!

NEW T-J Spacemaker AIR CYLINDERS

These new T-J Cylinders *save up to 40% in mounting space*—with streamlined design that eliminates tie rods. They're *super rugged*—extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, hard chrome plated piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.



T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

4 WEEKS DELIVERY on the Spacemaker—any style, any stroke, 1" to 3" diam.

T-J

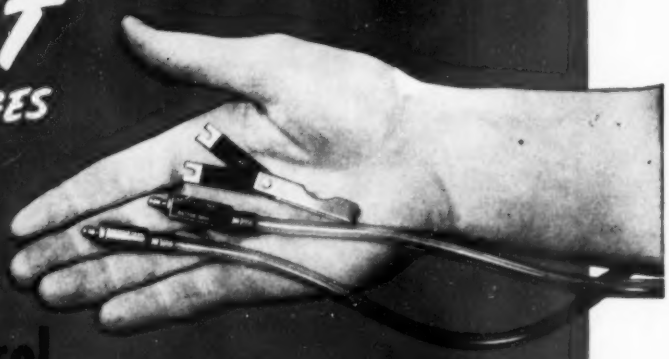
TOMKINS-JOHNSON

RIVETORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS

37 YEARS EXPERIENCE

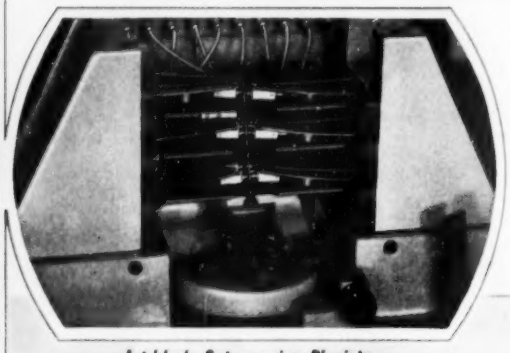
PLUNJET
GAGING CARTRIDGES

WIDELY USED For Inspection and Machine Control

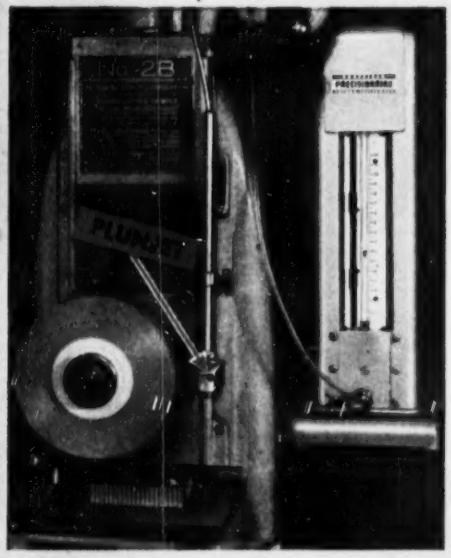


The Plunjet is made with both rectangular and cylindrical shoes and long housings.

Plunjets with Precisionaire for checking jet engine blades.



Jet blade fixture using Plunjets.



Plunjet feed gage enables operator to grind to a degree of accuracy previously impossible.

PLUNJET GAGING CARTRIDGES... the self-contained gaging heads you can use practically everywhere, were developed by Sheffield in 1949.

THOUSANDS ARE NOW IN USE on a wide variety of gaging fixtures and machine control applications.

MORE THAN FIVE THOUSAND are used on gages for checking jet engine blades.

PLUNJET GAGING CARTRIDGES ARE STANDARD LOW-COST STOCK ITEMS which can be applied by users to practically any gaging fixture or machine tool control where indication is required.

***WRITE FOR ENGINEERING DATA** giving ranges, amplifications, applications, mounting dimensions and prices.*

IMMEDIATE DELIVERY FROM STOCK

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SHEFFIELD HEADQUARTERS

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GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTACT SERVICE

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

A Machine Surplus Pays Off

There is virtually no surplus of factory workers today. If we are to believe the statisticians, there will be little if any surplus for a number of years.

The high birth rate in the 1940's resulted in bulging nurseries. The rapid increase in the school population in the 1950's means bulging schools (and higher school taxes). But there is not likely to be a big bulge in the labor force until at least the 1960's.

This should not be a cause for alarm. If business stays at a high level, no rationing of labor should be necessary. But better use of the available labor force will be highly desirable and profitable.

More than that, labor will become more expensive. Who is so foolish as to think that the upward trend of labor rates is likely to be reversed? Anyone who thinks so should have his head examined.

As such thoughts race through one's mind, the philosophy on capital equipment expounded by H Thomas Hollowell, Jr, president of the Standard Pressed Steel Co, hits with terrific impact.

Mr Hallowell's idea is simple. He believes in a surplus of machine power rather than manpower. Confronted by a manpower shortage, what idea could hold more appeal to management?

His factory has ten machines for every eight operators. He points out that the interest on a $10,000 machine is less than $10 a week. That sum represents an operator's pay for only a few hours.

He figures then that it costs less to shift a man from one machine to another than to shift a machine from one job to another. In the latter case, it is necessary to pay for downtime on both the man and the machine.

Mr Hallowell does not worry unduly about excessive idleness of his machines. Like the housewife with her automatic washing machine and her vacuum cleaner, when he wants and needs machines, they are there. And they do a good job and pay for themselves.

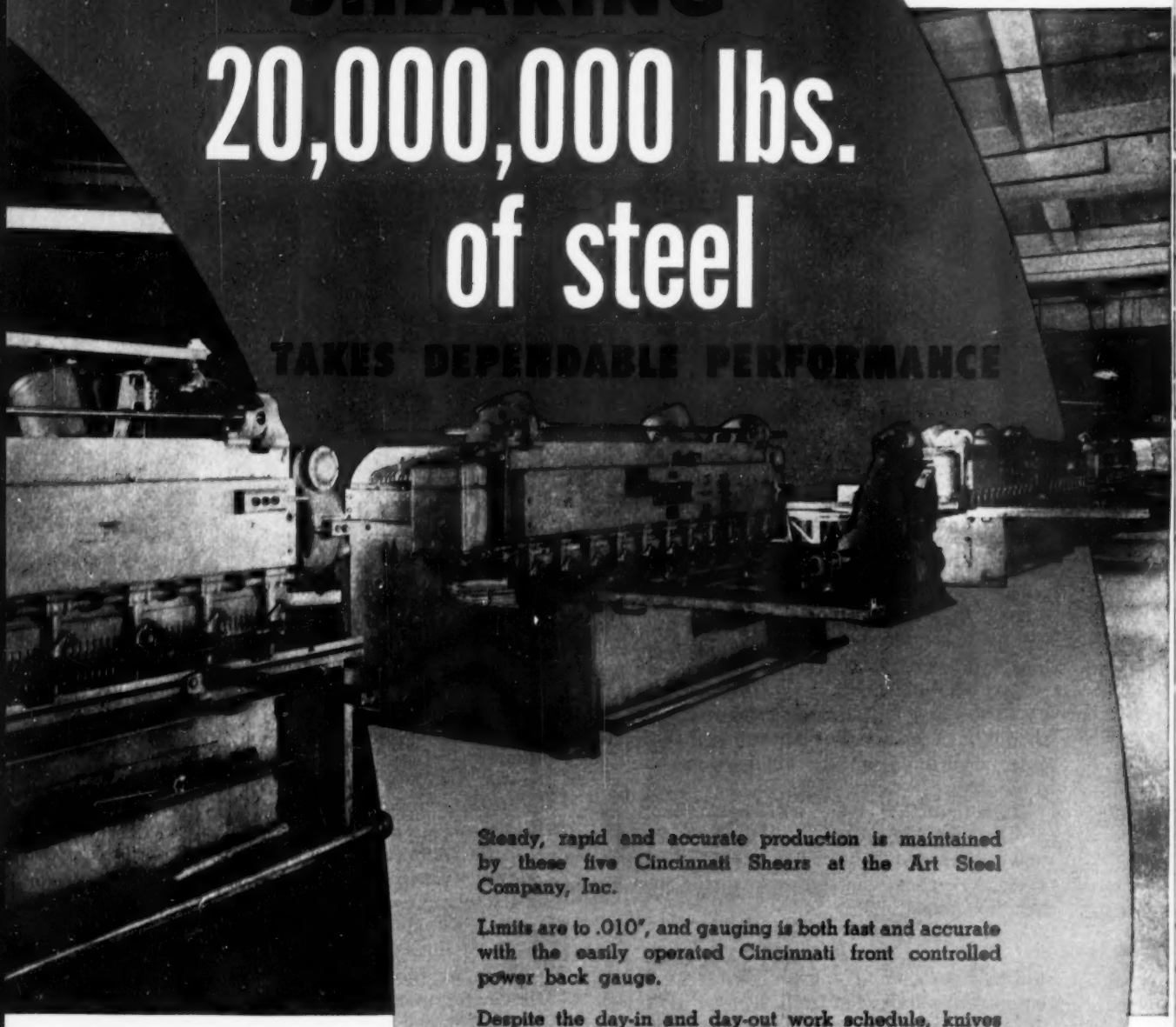
Aside from the labor angle, the surplus of machines provides flexibility in shop production. It also insures adequate production facilities at peak times. How much profit can be lost as a result of inadequate facilities?

Thus Mr Hallowell takes up the cudgel in a convincing manner on behalf of more machines instead of more men. With the labor situation what it is and what it promises to be, it will pay metalworking managements to sharpen their pencils and figure out how this theory will pay off in their own shops.

Instead of being a liability, a surplus of the right machines may be one of management's most profitable assets.

Burnham Finney

SHEARING
20,000,000 lbs. of steel
TAKES DEPENDABLE PERFORMANCE



Steady, rapid and accurate production is maintained by these five Cincinnati Shears at the Art Steel Company, Inc.

Limits are to .010", and gauging is both fast and accurate with the easily operated Cincinnati front controlled power back gauge.

Despite the day-in and day-out work schedule, knives are sharpened but once a year.

Investigate these accurate, dependable Cincinnati Shears—you will find them profitable in your shop. Remember, straight-edged square blanks, accurate to size, are produced at low cost on these modern Cincinnati Shears.

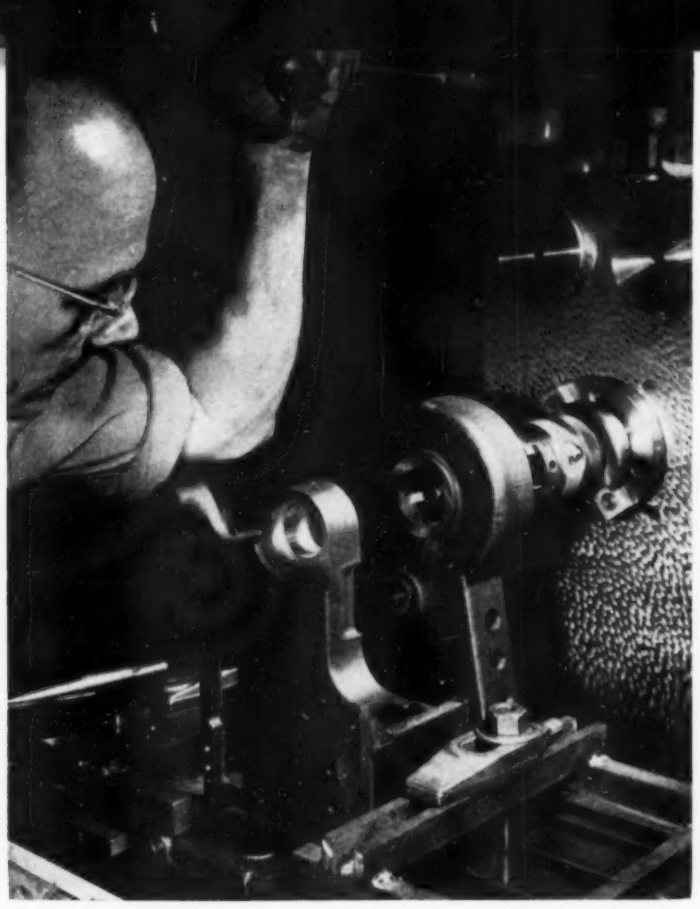
Write for Shear Catalog S-6.

Photos—
Courtesy the Art Steel Co., Inc.,
New York, N. Y.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI



BORED AND REAMED IN A MILLING MACHINE are the unusual lot of four bearing holes in the casting assembly. Assembly is clamped on the table against a ground locating pad and the boring bar is mounted in the spindle. Casting is located for each hole by vertical and horizontal traverse settings of the table and feed is provided by cross traverse at ½ ipm. For the two holes in line, the spindle is stopped and boring bar reset after boring the smaller hole. Following boring in each hole, a reamer is mounted in the spindle to ream holes to ± 0.0002 in. For the two holes in line, a stepped reamer with a guide bushing mounted on the overarm provides required accuracy

when goniometers measure to ±0.0025°

PRECISION TOOLING IS A MUST

BY ANDERSON ASHBURN, ASSOCIATE EDITOR

Add the requirement for complete interchangeability of parts to an operating tolerance in angular measurement of ± 0.0025°, and unusual shop procedures are to be expected.

At North American Philips, master parts and precision tooling with such unorthodox approaches as boring in a milling machine result in goniometers with the accuracy required for a spectrometer

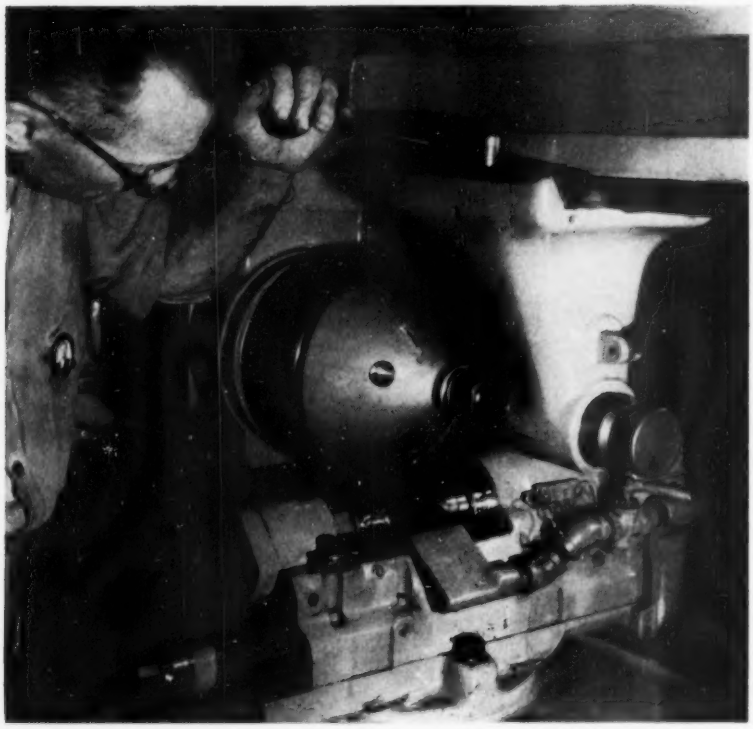
Goniometers are instruments for measuring angles. In the spectrometer built by North American Philips Co, Inc, in their plant at Mt Vernon, NY, a key instrument is the wide-range high- and low-angle goniometer for Geiger-counter analysis. It gives readings of angles down to 0.01° 2Θ with tolerances of ± 0.0025°. The value of 2Θ ranges from ⅛ to 2° per min.

In the spectrometer, X-rays are diffracted from a rotating specimen into a Geiger tube moving around the periphery of the goniometer. Accuracy depends on precise relation between movement of specimen and Geiger tube. Results are recorded on a strip chart from which either qualitative or quantitative analysis of the specimen can be made. Rapid checks are possible of significant lines.

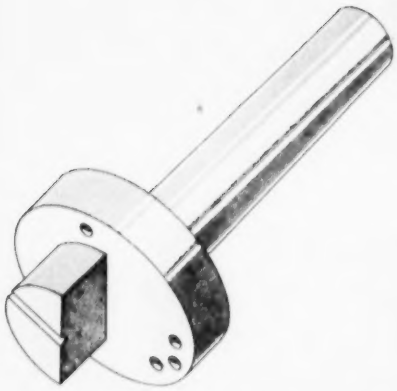
It is necessary to have complete interchangeability of parts both to permit changing the specimen holder and for field replacement. This eliminates the possibility of selective assembly.

Hardened master parts serve as the basis both for machine settings and for inspection. The frame is made from three major castings—front, back, and base. These are rough-machined, aged, finish-machined, and assembled. After being bolted together and aligned, the sections are permanently pinned together by drilling and reaming holes into which dowel pins are pressed. Nuts and threads are also sealed with Glyptol cement. Some of the more unusual operations in making parts for the goniometer are described here.

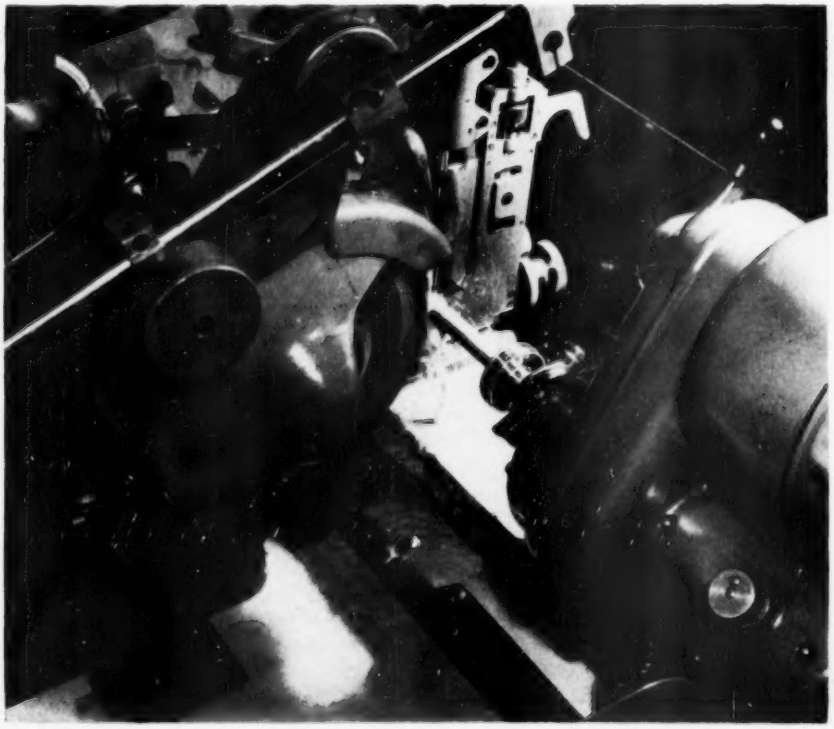
PRECISION TOOLING IS A MUST... continued



MAIN GEAR IS HOBBED in a special Barber-Colman assembled with selected gears for greater accuracy. This 10-in. special spur gear looks like a spur, but isn't. Because it must mate with a worm without backlash, special tooth form was designed to provide an angular contact line between each tooth and the worm rather than the contact parallel to the tooth edge of a normal spur tooth. Tool composite error on 360° rotation cannot exceed 0.0002-in. full indicator reading

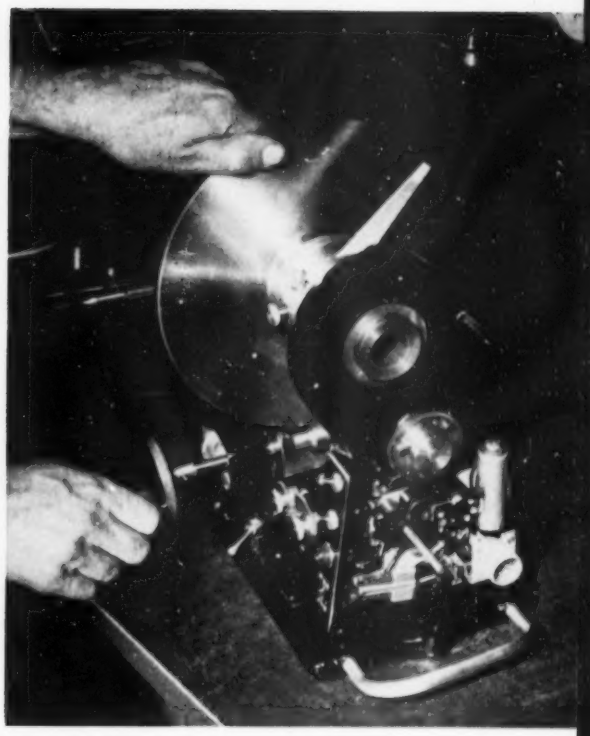


SPECIMEN HOLDER has two critical dimensions. OD of the shaft section must be ground to +0.0000 −0.0002 in. because different specimen holders are interchangeable in a single mounting sleeve. The milled flat for mounting the specimen must be held to +0.0002 −0.0000 in relation to shaft centerline

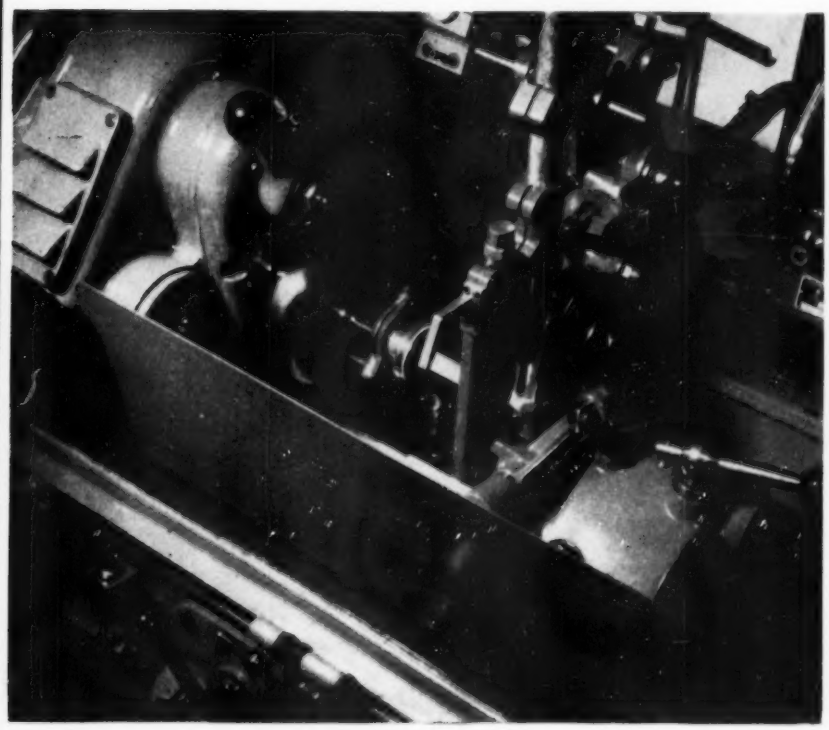


SHAFT OD IS FIRST GROUND on a Mipsa Etamic grinder. This has a hydraulic circuit on the wheelfeed that is controlled by a gaging plunger riding on the work. Gage is adjusted so that plunger opens bypass valve and stops feed when size is reached. Wheel is dressed with a conventional diamond dresser and does not need resetting when dressed. Gage is so sensitive that score marks in surface below size will shut off machine. Holder is then held by shaft in a hardened and ground fixture on milling-machine table and cutter adjusted to a setting block on fixture to mill flat to position in relation to shaft

ECCENTRIC MOUNTING FOR SHAFT of special spur gear provides adjustment during cold working, run-in, and test. When adjustment is complete, pointed setscrew is run down to cut into eccentric and lock it. Glyptol cement is then applied to setscrew to seal it and a second setscrew, with flat bottom, is run down and locked against the first to safeguard against loss of adjustment. Lever for adjusting eccentric is then removed



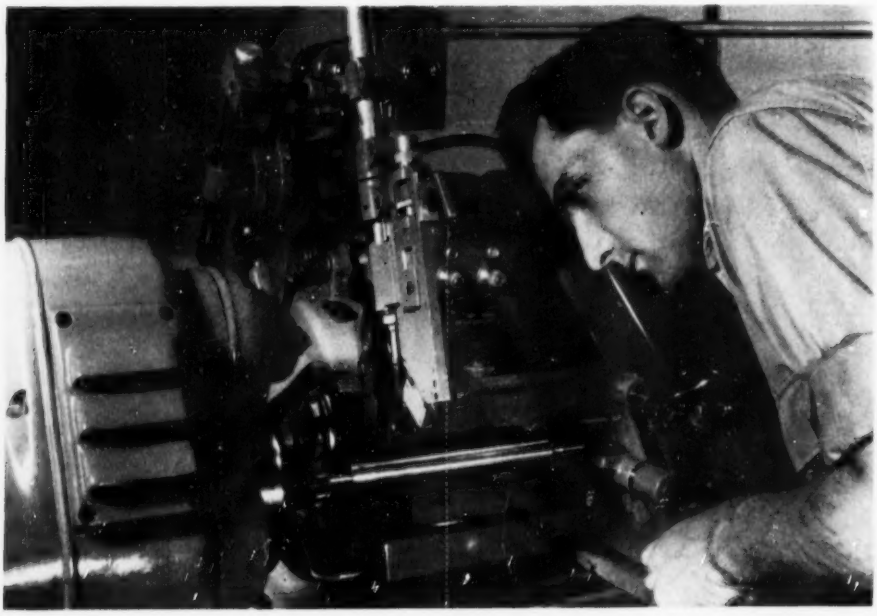
EACH ASSEMBLY of special spur gear and worm is run in. Gear is adjusted for highest spot and run by hand with a non-abrasive, non-loading compound until that spot is eliminated. Eccentric is adjusted on each successive high spot until backlash is eliminated through entire periphery of gear. Time for this run-in averages 30 to 60 min.



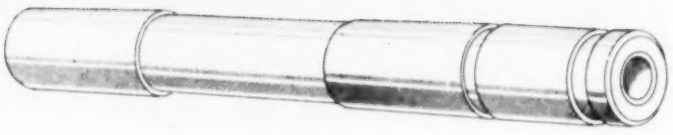
ETAMIC GRINDER from front of machine shows hydraulic control cylinder above work with plunger riding on top of shaft at point where wheel contacts side of work

FOUR DIFFERENT HERRINGBONE GEARS required are produced by assembling right- and left-hand helical gears. Each gear is hobbed to a total composite error on 360° rotation not to exceed 0.0002 in. full indicator reading. One gear of each pair is drilled with three 0.199 holes, the other is spotted from this and drilled with three 0.136 holes and tapped with a No. 8-32 NC-2 tap for socket-head capscrews. Heads may or may not be recessed in the untapped gear depending on location in the goniometer. This arrangement provides a slight adjustment between the mating gears

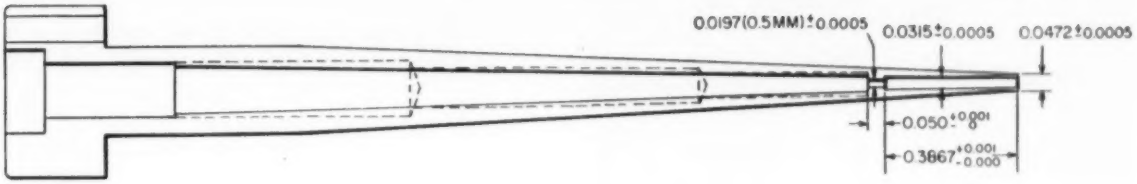
AFTER ADJUSTMENT with a hardened master gear to true indicator reading, the relative positions are held by the tightened capscrews while the assembly is spotted and drilled with two 0.120 holes for dowels to permanently pin the gears in relative position. This herringbone has 196 teeth with a 25° helix on each mating half

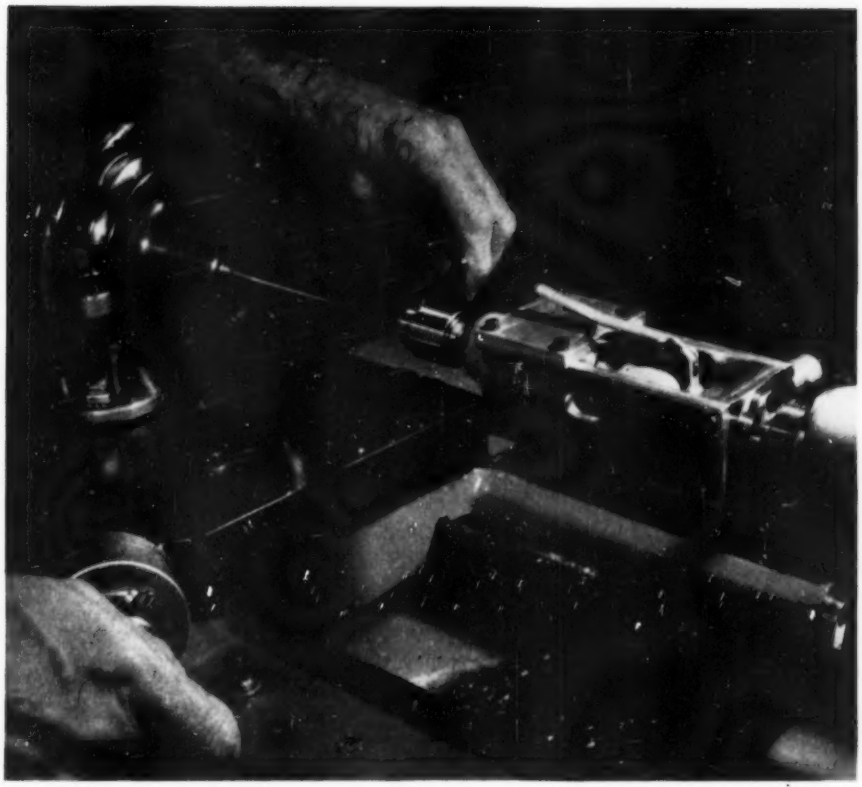


SLEEVE in which specimen holder is mounted must be concentric between ID and OD within 0.0004 in. throughout more than 8-in. length. The sleeve ID is first broached to within 1/32 in., reamed to within 0.0005 to 0.0007 in., and then honed to ± 0.00015 in. This surface then fits over a mandrel on the Etamic grinder to grind OD. Mandrel is hardened, ground, stress relieved, and ground for accurate fit. Undercuts on OD are lathe cut after grinding, otherwise they would trip the size-control plunger

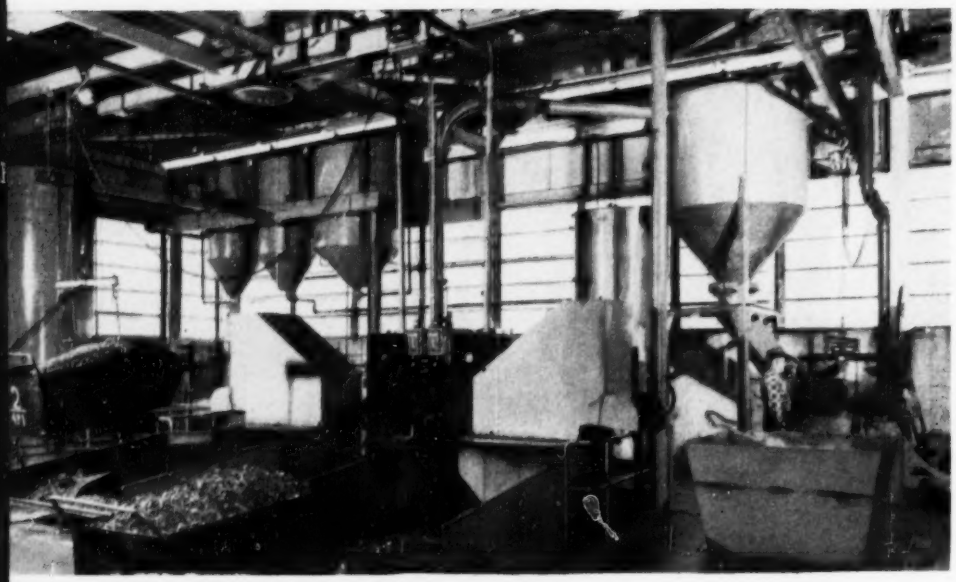


COLLIMATORS ARE ALIGNED optically in the diffraction camera. X-ray beam enters through one 0.0197 hole, leaves through the other unless diffracted by specimen. Any misalignment would cause X-ray to strike tube, producing brass lines on the film. Initial alignment is with a pin through the two tubes. This is refined optically with eccentric on one tube, finally checked by running a film. Housing is casting that must hold film accurately around inside of rim. Surface is machined, then finished by polishing and satin chrome plating directly on the surface without copper or nickel base

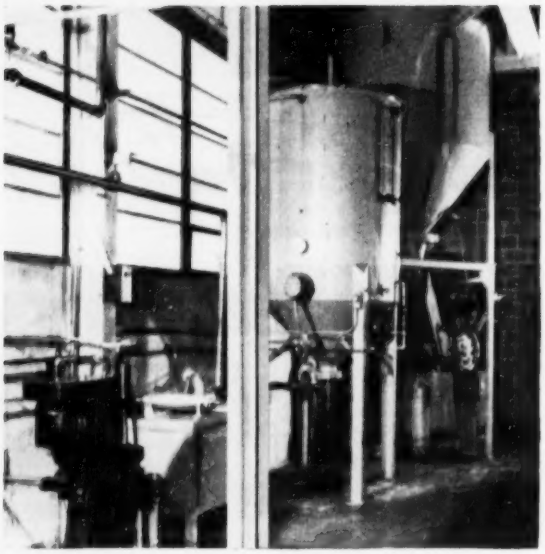




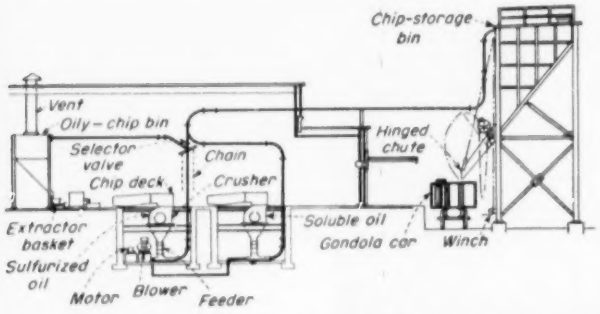
0.0197 HOLE — Collimators required in the diffraction camera are tapered brass tubes with a 0.0197-in.-dia hole in the tip. Collimator is first step-drilled from the large end to depth. It is then chucked in headstock of a Monarch 10EE precision lathe. A Dumore airdrill is chucked in the tailstock. Collimator rotates counterclockwise at 2500 rpm and drill clockwise at 2000 rpm. Tail stock is released so that it can be advanced by finger pressure directly on the tailstock housing for required sensitive feed. Hole is 0.4367 in. deep and caused extensive drill breakage until this method was adopted. A second hole is then drilled in the same setup. It is a 0.0315 hole in the end of the 0.0472-in.-dia collimater tube and is drilled to depth by mounting a stop on lathe bed. Completed tube is hard chrome plated



FAIRFIELD'S CHIP-HANDLING ROOM is neat and efficient. Chips are carted in, dumped into chip crushers (left and center), then drained in hopper (right, rear). Wringing is done at centrifuge (right of hopper). Finally they are dumped into conveyor loader and carried pneumatically to railroad cars for shipment to scrap dealers



SULFURIZED OILS ARE DRAINED from hopper and wringer to heating tank (left of drain hopper), centrifuged. Finally they are mixed with new oil and pumped back to machining area for use as coolants



COMPLETE SYSTEM INCLUDES TWO CHIP CRUSHERS, one for chips with sulfurized oils, which are reclaimed; and one for chips with soluble oils, which are drained from chips and discarded

Oils decide which

BY JOHN D ROMER, VP, Engineering,

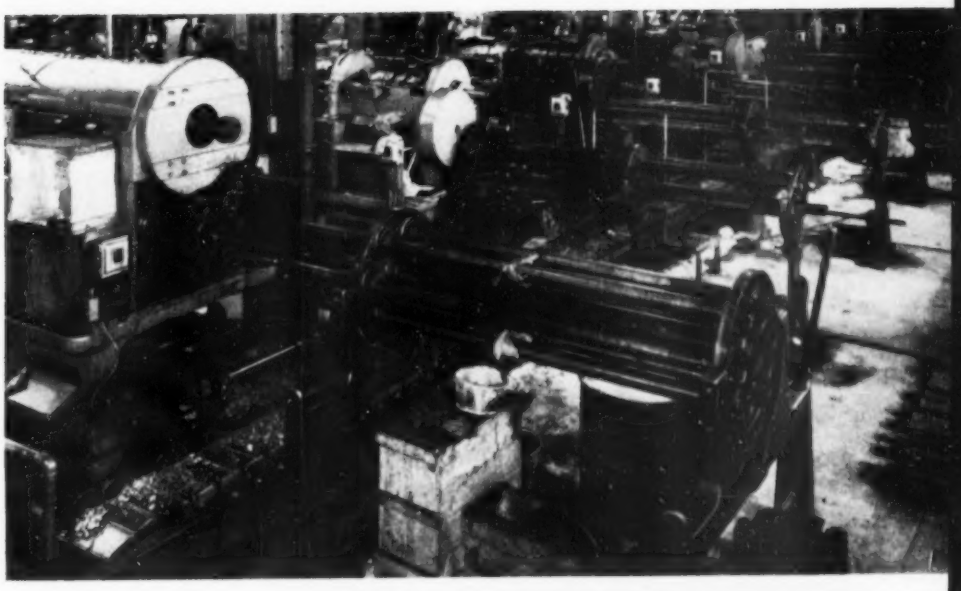
To wring or not to wring—it's not so difficult a ques- and coolants involved. Here are two companies that that require different cutting fluids. Why has one reclaiming setup while the other has only a simple

The difference is in the oils; soluble water-base coolants are not always worth saving, while sulfurized cutting oils are expensive enough to warrant extraction and reclamation.

The cutting job determines the right coolant, so after the oil has been picked, the decision on chip processing can be made.

In the case of Gemmer Mfg Co, Detroit, where some of the accompanying photos were taken, the decision was easy. The water-soluble oil is inexpensive, and it is also low in viscosity so it drains readily from the chips. Machine tools have uphill conveyorized chip discharge, which allows practically all of the liquid to run back to the machine sump. Therefore, the actual coolant loss is relatively low.

Gemmer does use a chip crusher, however, but not because of the coolant. The reason is that drained and crushed chips bring a higher price from scrap dealers; also, Gemmer can load RR cars to capacity, which gives maximum shipping economy and allows sending the chips to the best current market. Another reason for the crusher is that crushed chips can be moved from inside the plant to the car-load-



GEMMER'S LAYOUT is served by an extensive apron-conveyor network. Short units that take chips out of the screw machines are slanted up to allow soluble oil to drain back into sump before chips are dumped into long conveyor running the length of the machine line. Actual quantity of oil carried along to crusher is small in comparison to amount in sumps

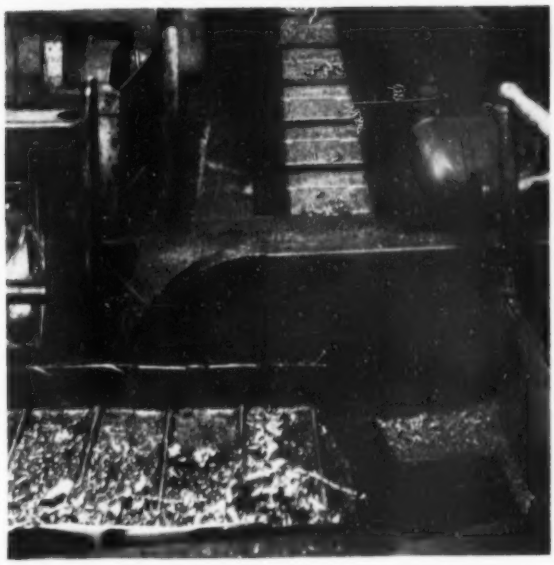
chip system to use

NATIONAL CONVEYORS CO, INC

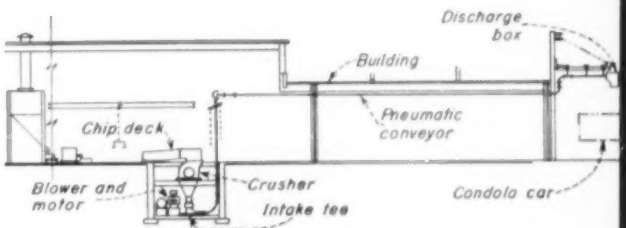
tion, after all, if you decide it on the basis of oils produce similar chips, but have machining operations plant installed an elaborate chip-wringing and oil-crushing system? Here are reasons

ing platform—in fact, directly to the cars—by conveyor, which is quick, troublefree, and cheap.

A more complete chip-handling setup, as at Fairfield Mfg Co, Lafayette, Ind, is illustrated in the remaining photos. Here the work called for sulfurized oils, which almost automatically meant that crushing, wringing, and oil processing would be economically reasonable. A breakdown of costs over three months of operations showed that 44,365 gallons of oil were reclaimed from 1015 tons of chips at a cost of $968.44 for labor. The oil savings amounted to $15,850 at $0.36 per gallon. During this period, only 2470 gallons of makeup oil were added to the system, which indicates the actual loss of oil—in chips, on the shop floor, etc—that cannot be avoided. The crushing and conveying equipment at Fairfield cost about $40,000; but the equipment necessary for oil handling—a Sharples purifier, a Tolhurst chip wringer, a sterilizer, two pumps, a tank, and some piping—cost $7482. The margin of savings as a result of oil reclamation will easily pay for this equipment in a short time—and will actually pay for the crushing and conveying equipment, too.



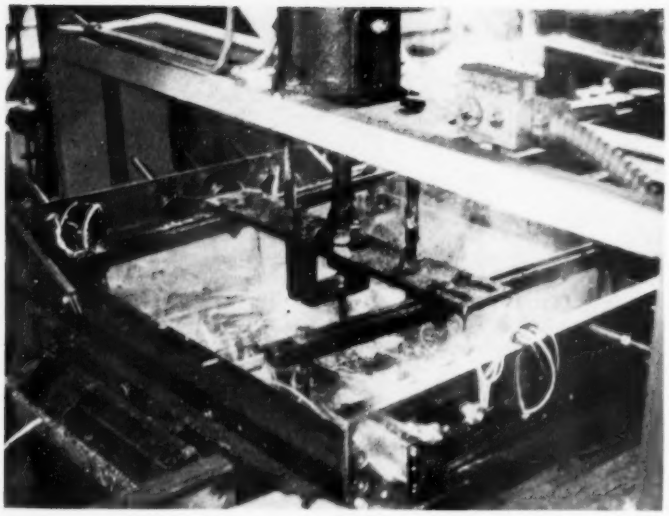
CONVEYOR INTERSECTION is built into floor, with feed running into trench, and receiving conveyor running from under feeder up to desired level. Floorplates and guards allow easy cleaning



SIMPLE CHIP-HANDLING SYSTEM has few units. Conveyors bring chips to crusher; chips are pneumatically conveyed to loading heads siding. Cars are loaded progressively without respotting

Mechanized dip soldering makes better TV sets

Automatic machine installed in assembly line solders over 400 joints simultaneously. Combined with automatic, multiple riveters, it results in faster production, better TV performance, and easier servicing



TELEVISION CHASSIS in solder pool of machine. Air cylinder at top counteracts bellying of chassis from heat by lowering rods to hold it firmly on bars projecting slightly above surface of solder pool

BY K M LORD, Plant Mgr, Radio & Television Dept, GENERAL ELECTRIC CO, Syracuse, N. Y.

Two plants of General Electric Co have been using a mechanized dip-solder process in the manufacture of radios at the Utica, N Y, plant, and television sets at Electronics Park, Syracuse. The new technique replaces the slower, less-efficient process of assembling hundreds of parts with needle-nose pliers and a hand soldering iron.

The primary benefits of dip-soldering as a production technique have been increased efficiency in the factory and better performance of radio and TV sets in the home.

Four years ago, the mechanized soldering method was first applied in the final assembly of components on television terminal boards. Since then, the method has been mastered to the point at which the entire main chassis of both television and radio receivers are produced in this way.

Application of dip-soldering to moving-conveyor assembly of receivers involved almost 100% revision in subassembly lines, in component fabrication methods, and in main assembly lines.

DIP-SOLDER MACHINES

Although the dip-solder machine has a potential capacity of 350 chassis per hr, actual production varies with the schedule of the assembly line which feeds it. On television lines, the machines are used to flux and dip-solder a chassis measuring 13½ in. square and containing 424 terminal pins each having from one to four leads. Similar machines are used to solder 51 pins simultaneously in a terminal board and 40 pins in a radio chassis.

A dip-solder machine consists of a flux tank, a solder tank, a sprocket-driven endless-chain conveyor which travels over the tanks, and auxiliary equipment.

Rods of solder are dropped into a pot at the rear of the machine, where the temperature is raised to the degree needed, and automatically fed into the solder pot at a rate designed to maintain a constant level.

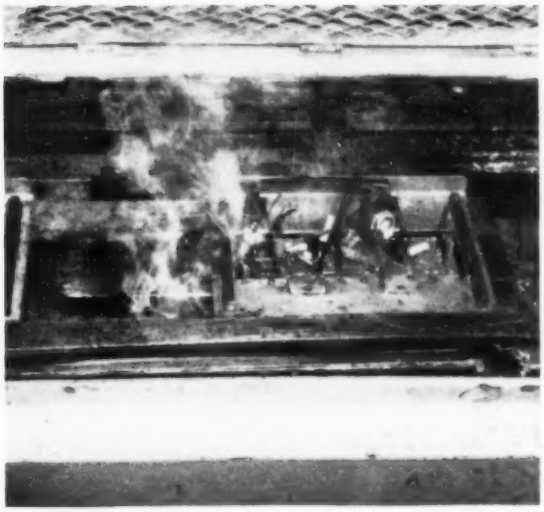
Each television chassis is removed from its assembly line and fitted into a rack on an endless conveyor which carries it through the automatic solder operation. It is lowered first into the flux, then into the solder tanks by four air cylinders. Cylinder stroke and return, and dwell time in the flux and solder tanks are controlled by a series of snap-action switches and time-delay relays. An automatic timing unit preheats the solder tank before the start of a work shift and turns off the heat at the close of the shift. A solder temperature of 600 F is maintained by a thermostatic control.

Dross is skimmed off the solder surface each time a chassis is dipped, by chrome-plated hinged wiper blades built into the rear of each chassis-holding fixture. Fumes are carried off by an exhaust hood over the machine.

As each chassis is lowered into the bath, capillary action draws the solder up into the tubular ground pins. This provides uniform and complete solder connections at each terminal and little or no chance for excess solder to cause shorts.

After removal from the machine, the chassis is subjected to a violent vibration on a shake table. Imperfections in dip-soldering quickly show up under this unusual stress, as loose parts will drop out. This rarely occurs in practice, but the shake table serves also to clear out scraps that fall into the chassis during assembly.

After the shake-table operation, the chassis is lifted back onto the main conveyor. Here it passes



DIP-SOLDERING POSITION on conveyor line for TV subassembly terminal board. Solder tank is raised by air cylinders to come up to terminals

through a series of stages during which it is prepared for installation of tubes and transformers.

Before tubes are inserted in the television chassis, a final visual check is made to determine whether all connections have been made and all components are in proper position. So efficient has dip solder proved that only one repair station is operated for each assembly line. At this station, any necessary adjustments are made by an operator using a conventional hand soldering iron, before the chassis passes on for completion of assembly.

OTHER DIP-SOLDER MACHINES

A slight variation in the method of dip soldering occurs when it is applied to smaller subassemblies and table-model radios. Here, resistors, capacitors, and wiring are hand-positioned in the same manner as on the television lines, but it is not necessary to remove the terminal boards or radio chassis units from the assembly line. Instead, the dip-solder machine is so installed as to form an integral part of the line. The work travels in its assembly rack directly through the flux bath. The length of the tank and the speed of the conveyor determine the time the part is immersed in the bath. When the part is ready for its solder bath, the solder tank is raised and lowered to perform the dip-solder operation.

Many important advantages have been realized since the dip-solder method of assembly was begun. Perhaps the most important is the increased reliability of the finished product. The hundreds of connections involved in a modern television receiver are made with absolute uniformity in respect to the amount of solder used and the temperature applied. This means a consistent, reliable chassis and superior performance. Because the possibility of damaging components by overheating is eliminated, component failure in finished receivers is sharply reduced.

Less wiring is required as compared to a conventional chassis. This minimizes problems of establishing and maintaining lead-dress and spacing in the closely packed and complex interior of the receiver.

TRAINING TIME

Dip soldering has meant a marked reduction in the time needed for training operators. The time required to train personnel on an assembly line has been cut by one week where that line involves dip soldering.

No tools are required in the manual positioning of components, in contrast to the need for crimping pliers, soldering irons and other tools in assembling the conventional chassis. Because this mechanization reduces the degree of skill required for final-assembly work, the labor force is now more flexible and its distribution within the over-all production pattern is simplified.

Breadboard mockups mounted in front of each operator show the wiring and component positioning assigned to her station. Even a novice operator can quickly compare the work before her with that on the breadboard. These training devices consist of actual components mounted on a full-size pictorial layout diagram of the pertinent portion of the chassis.

Since the installation of dip-solder machines, a definite improvement in employee morale has been noted. With elimination of the hand soldering iron, the work is cleaner and much less tiring. Irritation from flux fumes which accompany hand soldering is completely absent because the entire dip-solder mechanism is enclosed and ventilated.

Those employees formerly engaged in selecting, trimming, shaping, crimping and soldering each component are released to be more efficiently used in the manufacture of component parts.

Manufacturing costs have been reduced through lessening of the possibility of damage to components, and the margin of error in the assembly operation has been cut.

The reduction in the amount of wiring means an increase in the space available for components, and aids immeasurably in parts standardization. This is important from a manufacturing standpoint but is, perhaps, of even greater importance from a servicing standpoint. For example, capacitors of equal value, supplied by different vendors, may show considerable variation in size. In a conventional chassis, oversize parts from one vendor might have to be wired outside the engineered pattern of the chasis. In the dip-soldered chassis, however, sufficient room is available to accommodate components of a different size than specified in the original design.

Still another important advantage is reduced service cost to the consumer. To break one connection in a hand-soldered television or radio receiver, the serviceman might find it necessary to remove three or more individually soldered connections with several applications of heat. In a dip-soldered chassis, the operation can be accomplished with a single touch of the soldering iron. This, too, reduces the possibility of damage by heat to delicate components, speeds up the repair job, results in less repair cost to the owner and causes less disturbance to the basic balance of the circuit.

Cope Talks on Draw Dies...II

Accurate blank layout aids the diemaker

Of the many ways of computing blank diameters, the graphical method is preferred for the stated conditions. There is less chance of an error or oversight, and the method is accurate enough for all purposes

BY STANLEY R COPE, President
ACME SCHOOL OF DIE DESIGN ENGINEERING

When a drawn stamping is released for production, the die designer must determine the diameter of the flat blank for the shell. This is necessary before the number of operations required to produce the shell is found, because the diameter to which the first shell can be drawn bears a direct relationship to the blank diameter. The blank diameter is also needed for laying out the blanking die.

Various methods have been developed for computing the diameters of blanks for drawn shells. Some methods involve mathematics entirely, others make use of graphical layouts, and still others require the use of both mathematics and layouts. Some methods are limited to certain types of shells, while

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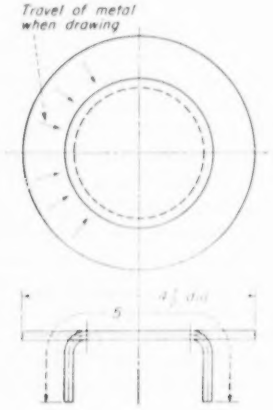


FIG. 1 ... Blank diameter is always less than the distance measured through the center of the shell, because metal travels inward from the periphery of the blank

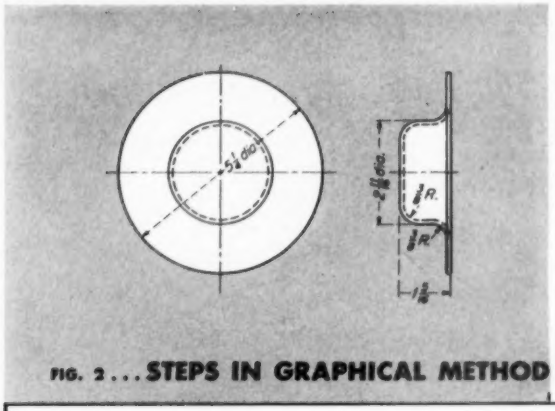
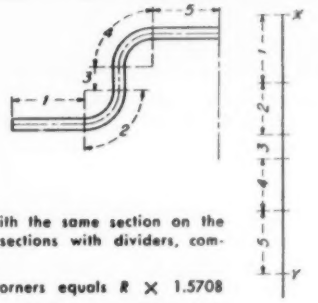


FIG. 2 ... STEPS IN GRAPHICAL METHOD FOR

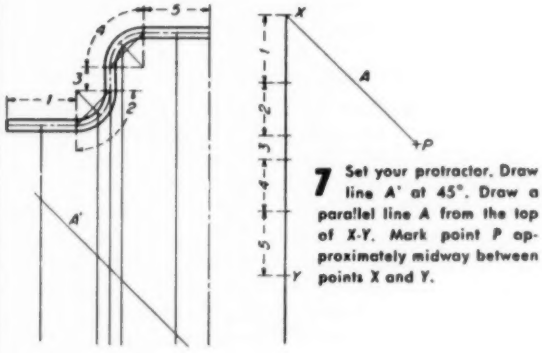


5 Draw vertical line X-Y and mark off the length of each section accurately, starting with No. 1 section at the top of the line. Number each section to correspond with the same section on the shell. Transfer straight sections with dividers, compute curved sections:

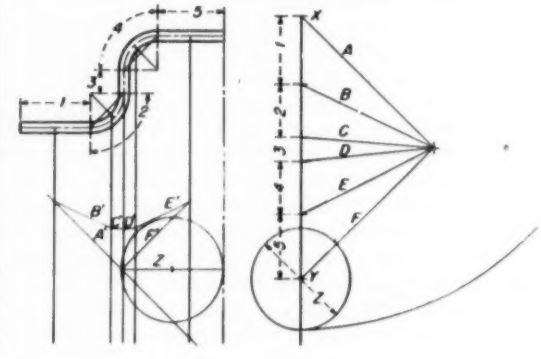
Distance around 90° corners equals $R \times 1.5708$

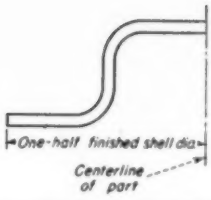
Distance around corners which are less than 90° equals $R \times 0.01745 \times$ number of degrees

R equals radius of arc measured to center of stock

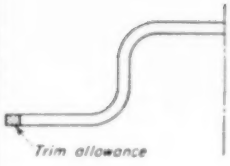


7 Set your protractor. Draw line A' at 45°. Draw a parallel line A from the top of X-Y. Mark point P approximately midway between points X and Y.

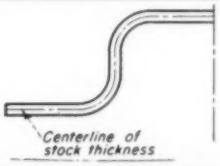




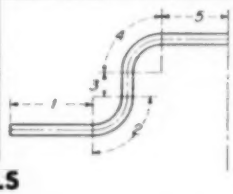
1 Accurately lay out one-half of the finished shell to the left of the center line, with the open end of the stamping facing downward. The shell should preferably be drawn full size



2 If the drawn shell is to be trimmed, add extra stock for the flange. The stock depends upon: thickness, shape of the shell, type of the trimming die, and number of drawing operations. Not less than one thickness of stock should be trimmed off at the narrowest point. The minimum allowance should not be less than 1/16 in. Allowances for trimming range from 1½*t* to 10 *t* on a side.

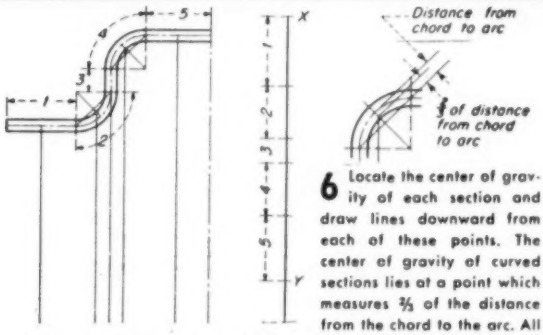


3 Draw a light solid line through the center of the stock. All measurements and calculations are made from this line.

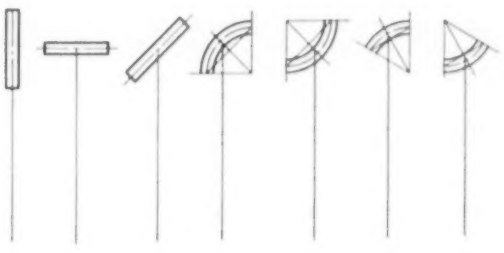


4 Divide curved and straight portions of the shell into sections. Number each section. No. 1 section is always at the left of the layout.

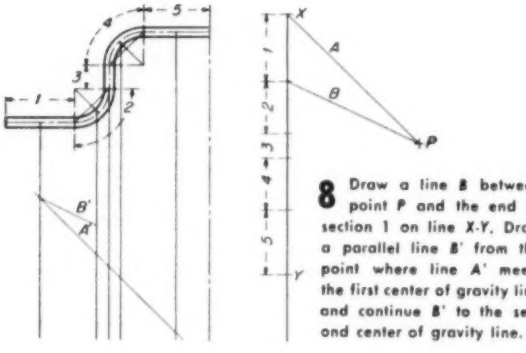
FINDING BLANK DIAMETERS FOR DRAWN SHELLS



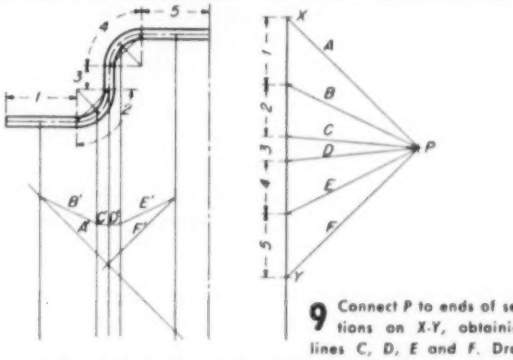
6 Locate the center of gravity of each section and draw lines downward from each of these points. The center of gravity of curved sections lies at a point which measures ⅔ of the distance from the chord to the arc. All shells are made up of horizontal, vertical, slanting and curved sections. Drawings show how the center of gravity is found for each kind of section.



Centers of gravity for various sections



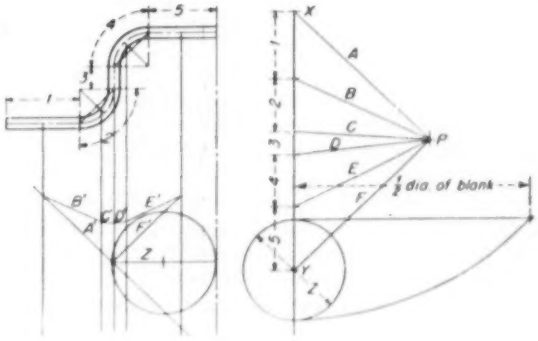
8 Draw a line *B* between point *P* and the end of section 1 on line *X-Y*. Draw a parallel line *B'* from the point where line *A'* meets the first center of gravity line and continue *B'* to the second center of gravity line.



9 Connect *P* to ends of sections on *X-Y*, obtaining lines *C*, *D*, *E* and *F*. Draw parallel lines *C'*, *D'*, *E'*, and *F'*. Note that line *F'* starts at the point where *E'* intersects the fifth center of gravity line and that *F'* is continued until it intersects *A'*.

10 Draw horizontal line *Z* from a point where lines *A'* and *F'* meet, and continue it to the centerline of the shell. Using distance *Z* as a diameter, draw a circle with the center point at *Y* at the end of the line *X-Y*. Next, using point *X* draw an arc tangent with the bottom of the small circle.

11 Draw a horizontal line tangent with the top of the small circle, until it touches the large arc. The length of this line, measured from line *X-Y* to the large arc, is equal to one-half of the blank diameter. The actual dimension is found by scaling to the nearest one-half of a sixty-fourth.



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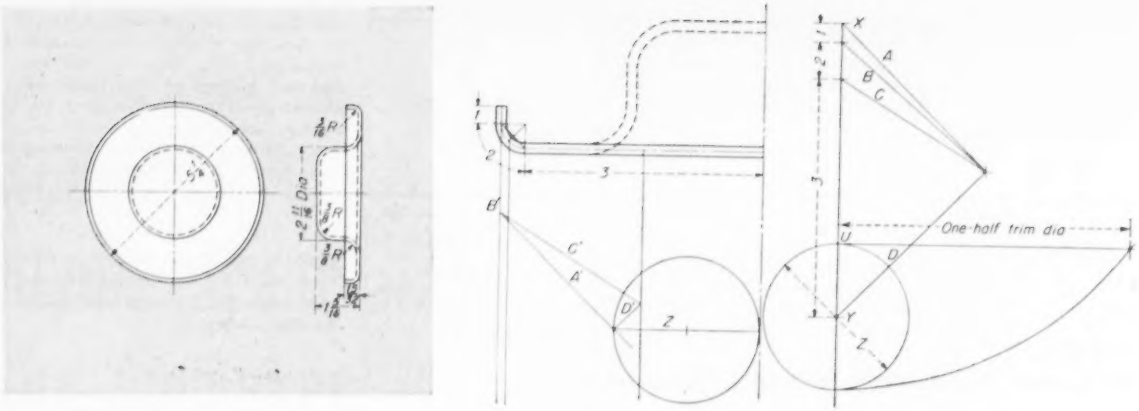


FIGS. 3 to 5 ... To find the blank diameter for a flanged shell, it is necessary to find the trimming diameter (Fig. 4) and then to add trim allowance (Fig. 5). Having this information, and using the shape in Fig. 5, the blank diameter is determined by the graphical method given step by step in Fig. 2

others are designed to be used for finding the blank diameter of a shell of any shape, provided that the plan view of the shell is circular.

All of these methods are alike in one respect—they are based on comparison of the area of the shell with the area of the blank. In other words, if the shell is divided into various sections (such as disks, rings, and cylinders) and each section is laid out flat, the sum of the areas of all sections is equal to the area of the blank.

The graphical method that I prefer is accurate, comparatively simple, and can be used to find the blank diameter of round shells of any cross-sectional shape, provided the thickness of metal is the same throughout the shell and that the shell is not bulged or necked in at the open end. If the side walls of a shell are thinner than the bottom, the blank diameter must be computed by volume. Bulged and necked shells are computed by area. For these cases different methods are used, and they will be explained later.

You must understand that the methods used for finding the lengths of blanks for bent stampings and those used for finding blank diameters are entirely different. The lengths of blanks for bent stampings are found by simply computing the distance through the center of the stamping.

Blanks for drawn shells are not computed on a "folding basis." They are found by comparing the area of the shell with that of the blank. When a round, flat blank is drawn into the shape of a shell, the metal travels inward from all directions around the entire periphery of the blank, as shown in Fig. 1. The drawing operation displaces the metal in a flat blank of a given weight into a shell of the same weight. For this reason the diameter of the blank is always considerably less than the distance measured through the center of the shell.

GRAPHICAL METHOD OF FINDING BLANK DIAMETERS

Several steps are required to find the diameter of a drawn shell. The exact procedure is the same for all shells regardless of the stock thickness, the size, or the shape. In Fig. 2 is shown a shell, together with the step-by-step procedure for finding the blank diameter.

COMPUTING TRIMMING DIAMETERS

When a shell is to be trimmed before it has been completed, the diameter of the trimmed shell must be found in addition to the blank diameter. The same graphical method is used for finding trimming diameters as that used for finding blank diameters.

The shell shown in Fig. 3 is to be produced in three operations: (1) blank and draw center, (2) trim, and (3) flange.

As the shell is to be trimmed before the flanging operation take place, it is necessary to know the diameter to which the shell will be trimmed in order to form a flange of the correct height. To find the trimming diameter, it is first necessary to lay out one-half of the finished shell (do not include that portion of the shell which has been previously drawn) as shown in Fig. 4. The trimming diameter is then found by following the same step-by-step procedure as previously described for blank diameters. In this case only three sections are involved. The trimming stock is then added, Fig. 5, and finally the blank diameter is found.

With both trimming and blanking diameters known, an accurate operation layout can be made for use in laying out the dies (Fig. 6).

Blank diameters, as found by all methods, are only approximate. In all cases the actual blank diameter must be developed by trial by the diemaker. Actual blank diameters vary as much as 1/16 in. for small

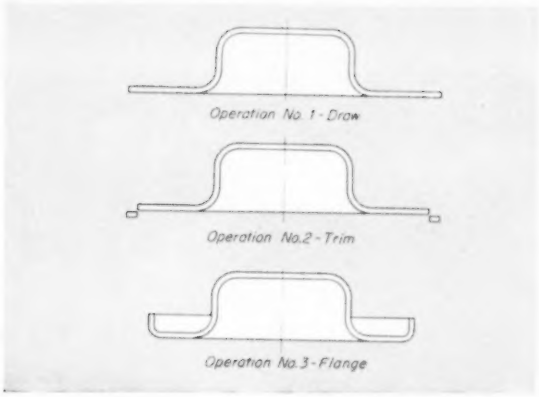


FIG. 6 ... An accurate operation layout for the flanged shell can be made, once the blanking and trimming diameters are known

shells, and up to ⅛ in. for large or deep shells, depending upon the variation in the metal thickness, the type of dies used, the size of the drawing radius, and other factors.

As all drawing operations stretch and consequently thin the metal at least a few thousandths of an inch, theoretical blank diameters will usually be found to be oversize. Therefore it is safe practice to order the sheets from which the shells will be drawn from the approximate blank diameter as found by the graphical method. Only enough sheets should be ordered from the original specifications for the initial run, however. Slight modifications in the width and length of the sheets can often be made after the stampings are in production at a considerable saving in material. Moreover, it would not be wise to order enough material for the entire job, because of the possibility of error in computing the blank diameter, which may cause the sheets to be too narrow. When the blanking die is laid out, the blank diameter should be given on the layout.

The actual blank diameter, as found by trial, should be very nearly equal to that found by the graphical method. If it is found to be much less than the minus variation given, the drawing dies are probably ironing or thinning the metal more than a normal amount. The dies should be corrected and made to draw in more metal before the blanking die is made. Otherwise much trouble will arise when an attempt is made to run the die in production. An approximate blank diameter, as found by the graphical method, serves the additional purpose of preventing the diemaker from being misled by the results of his trials if the dies are not correct.

SHEET-METAL TERMINOLOGY

There are several terms used to describe sheet metal, in regard to drawing properties. When a sheet can be plastically deformed without breaking, by forming or drawing, the metal is said to be "ductile." If the sheet breaks easily, after an attempt has been made to form or draw it, the metal is said to be "brittle." A perfectly brittle metal has no ductility.

"Toughness" is the opposite of brittleness. Toughness is the ability of the sheet to resist breaking or being pulled apart after the metal has begun to flow. A tough sheet of metal must be ductile; but toughness is not a true measure of ductility. A very tough sheet will draw under a great force suddenly applied; but a less tough sheet may draw equally as far if less force be applied slowly and gradually.

"Pliability" means that a sheet can easily be bent or deformed, but it does not necessarily determine its ductility. More pliable sheets become deformed with less pressure, but they may not possess as much ductility as do less pliable sheets. "Stiffness" is the opposite of pliability; that is, the sheet is relatively rigid and it cannot be bent or deformed unless considerable pressure is applied. A sheet may be somewhat stiff and yet it may have greater toughness and ductility than a non-pliable sheet. However, more force would be required to deform the stiffer sheet. The terms pliability and stiffness, in that order, should be used to differentiate between sheets which are comparatively easy to deform and those which are difficult to deform, as far as pressure requirements are concerned, and do not denote the ability of the metal to flow.

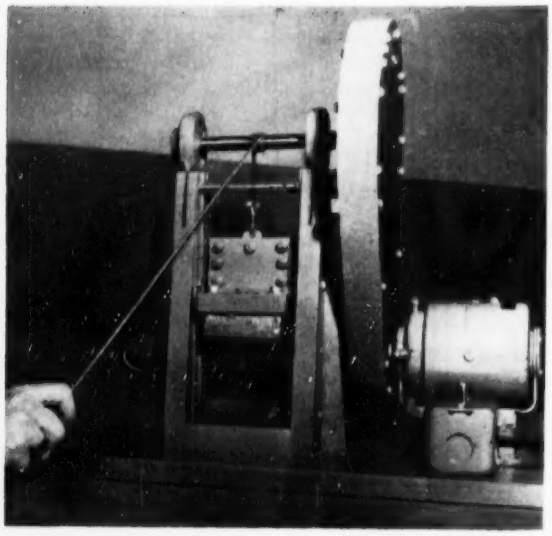
A sheet is referred to as being "hard," if it has the ability to resist being indented, scratched, or worn away by friction. Hardness must not be confused with brittleness, because sheets may be both hard and tough, and therefore relatively dutcile. When a sheet is referred to as being "soft," the term does not necessarily mean that it is the opposite of hard, or that the metal posseses that property which permits it to be scratched, abraded , or indented; but rather it implies pliability, or its ability to be worked easily at low pressures.

Part III of Mr Cope's series will appear in an early number

"My machine has been going psst, eek, erk, crunch, and grr all week, and now it just up and quit on me for no apparent reason."

DRAFTSMEN TRAINEES gather around an instructor as he explains the operation of a brake

New classroom methods keep trainees off plant floor



THIS WORKING MODEL of a drop hammer accurately forms metals, although it weighs only 9 lb

PHOTOGRAPHS and machine models now accomplish more in the training of Boeing Airplane Co draftsmen and engineers than formerly was possible in tours of the factory.

The shop tours were intended to acquaint trainees with machine operation, production and manufacturing facilities, and processes. Shops are not good classrooms, however, because of noise and other distractions. Also, foremen were not too anxious to have trainees wandering in their work areas. Since much of Boeing's work is highly secret in nature, tours had to be confined to certain portions of the factory.

With the new plan, models have been made of a drop hammer, brake press, hydropress, and stretch-wrap, while 350 photographs have been made of manufacturing processes.

Trainees now never leave the classroom for instruction. Models are demonstrated to them, while the colored slides illustrate the lectures.

The result, says the supervisor of the engineering training school, is an improved teaching technique which saves both time and money.

DON'T CHOP UP YOUR TRAINEES

By HAROLD D RHODENBAUGH

ABSORBING a worker into an industrial organization may be the best method of training, but it can be, and often is, disastrous.

Let's take an average man going into a large metalworking plant for the first time.

He is a high-school graduate—intelligent and eager to learn. He took machine shop back home in high school, and knows a little about the shop. He may have learned how to read micrometers and a scale, how to turn a shaft on a lathe and drill a hole in the shaft, but that's probably about all.

UNEASY APPRENTICE

As he walks onto the production floor, he is surrounded by shapes and sounds that are entirely strange to him. Although there is no danger to him, he feels a little afraid.

At the machine station, the new employee is perhaps introduced to the jobsetter or setup man, whose primary interest is in the jobs—tooling and machines. What does he know of the art of processing a new man? How much time can he spend and what does he know about teaching?

TYPICAL BREAK-IN

The new employee is taken over to a Warner & Swasey turret lathe bristling with tools. He has never seen a machine like this. Because a note from Personnel indicates to the jobsetter that the new man has had some job training, the conversation might go like this:

"Ever run a hand screw machine?"

"No, I never saw one."

"Well, there's really nothing to it. This here's a hand screw machine. We're running torque tubes. You turn, form, drill, bore, counter-bore, tap, face, and cutoff. I'll run you a couple pieces."

The veteran machinist turns to the machine and says over his shoulder, "I'd like to start you in on a simpler job, but there aren't any simple jobs around here. . . . Now, this is the way you start the machine." He pushes the switch.

"This is the speed," he points out, "and this is the feed. This is the pilot wheel that indexes the turret, like this. . . ."

The jobsetter runs through a machine cycle and the finished part drops off into his hand. He checks the part. Perhaps he explains what he is doing and why. If he does explain, he usually does so in terms that are unfamiliar to the new employee, talking so fast that only an old shop man would understand.

After running a few pieces, he stands by while the trainee makes a part per instructing words. Not satisfied but hoping his new employee will struggle along, the jobsetter departs, after warning the new man not to run scrap.

The new employee, standing alone before his machine feels like he has just been set adrift.

He reaches out and engages the clutch. The steel bar before him starts to spin. He hesitantly pulls another lever and the cutting tools go into their act. He leans forward, trying to get a better look at what is happening, but a flood of coolant covers the work. Not knowing what is happening, he can only hope that everything will be all right.

This situation is dangerous.

ACCIDENTS DO HAPPEN

In my shop experience I have seen a woman scalped when her hair got caught in a drillpress spindle; a man's thumb sheared off by a turret guide bar; four fingers lost by a trainee-operator who, during his first two hours on the job, tried to stop a slowly revolving 12-in. chuck with his hand; two fingers lost and a hand mutilated by a trainee trying to guide a steel shaving away from the cutting edge of a tool with his fingers. Add to these a number of less serious accidents that could have been avoided, had the operators been more carefully instructed.

It would be far better and cheaper for everyone involved if training were handled more sensibly. The jobsetter should be trained to accept and teach new men, who should be taken to a machine and given a brief description of what the machine is and does. The spindle might be set at a low rpm, and the trainees left alone to become accustomed to the environment while the jobsetter goes about his other duties.

When the instructor returns, he can begin more of a detailed description of the function of the machine controls. Each operation should be explained in relation to the complete machine cycle—not once but repeatedly, until the trainee *knows* what he is doing. At no time should instructions be given without allowing a reasonable amount of time to absorb the information.

ADVANCED TRAINING

And *real* training begins when the employee can operate his machine alone. Then a man can be taught feeds and speeds and their relation to various metals. He can be taught to operate his machine with minimum effort and maximum output. He should learn finishes and how to grind tools to obtain them; he could be taught different grades of carbides and how they are applied; how to read blueprints; the difference between critical dimensions and those which do not need a 100% check as they come off the machine. He can even be shown how to check whatever dimensions he can while the machine is in operation.

This kind of training will produce not just a half-baked lever-pusher, but a real worker who will be able to do more work, more safely in less time with less effort.

You don't have to batter it with a hammer.

Apply heat in the right place and it's easy to . . .

STRAIGHTEN A BENT SHAFT

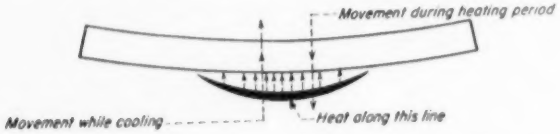
BY JOHN ZOLLINGER, Maintenance Supt, NATIONAL LEAD CO, TAHAWUS, N Y

It is surprising how few machinists know the procedure for straightening a bent shaft. Only a few days ago, we received a 4-in.-dia axle, marred with actually hundreds of ball-peen hammer marks distributed over its entire 12-ft length. Apart from the time it must have taken to do the job, it certainly looked like a botched-up job. The same practice is still followed in paper mills, where large shafts are commonly used and only minimum runout can be tolerated. It seems to be the common understanding that if a shaft is bent, as shown below, the material

along line *A* has to be elongated to force the curve into a line parallel with the axis. This no doubt can be accomplished, but it is time consuming and cannot be done to a highly finished piece of work.

In describing the method used in our shop, it may be well to keep in mind that any piece of work which can be straightened by peening can be handled much faster and without injury to the finish as follows:

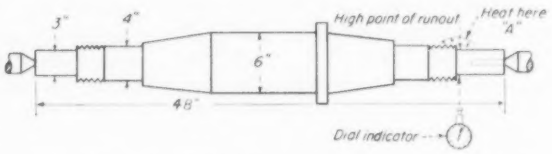
First of all, the principle is reversed, and in place of using a ball-peen hammer, we use the flame of an acetylene torch, and apply the heat at the *high* side of the bend, as shown below, concentrating in the



center and diminishing toward both ends. This will further bend the shaft and actually aggravate the condition. Heating is continued until the bend is twice the original severity. For example, if a straightedge is laid along the concave side of the shaft and we find the greatest depth to be 0.062 in., we continue the heating process until the gap becomes 0.125 in. or more. So far, we have been unable to work out a formula as to how far to go with the first heat, as each problem varies as to size of shaft, length in which a bend must be corrected, and the characteristics of the material. We have straightened drill stems 30 ft long, 7 in. in diameter, where the depth of the concave measured ½ in. and movement continued until it reached 1¼ in.

Referring to the original shaft, let us assume we now have depth of 0.125 in. The heat is stopped and the shaft allowed to cool. This may be hastened by applying air as a coolant. As the shaft cools, the motion is reversed and the shaft rapidly goes past the original distortion of 0.062 in. and may become inactive at 0.015 in. You now have something to work with, and a little calculation will probably enable you to bring it to zero with another heat. Care should be taken that heat is applied without discoloring the work, yet heating should be fast.

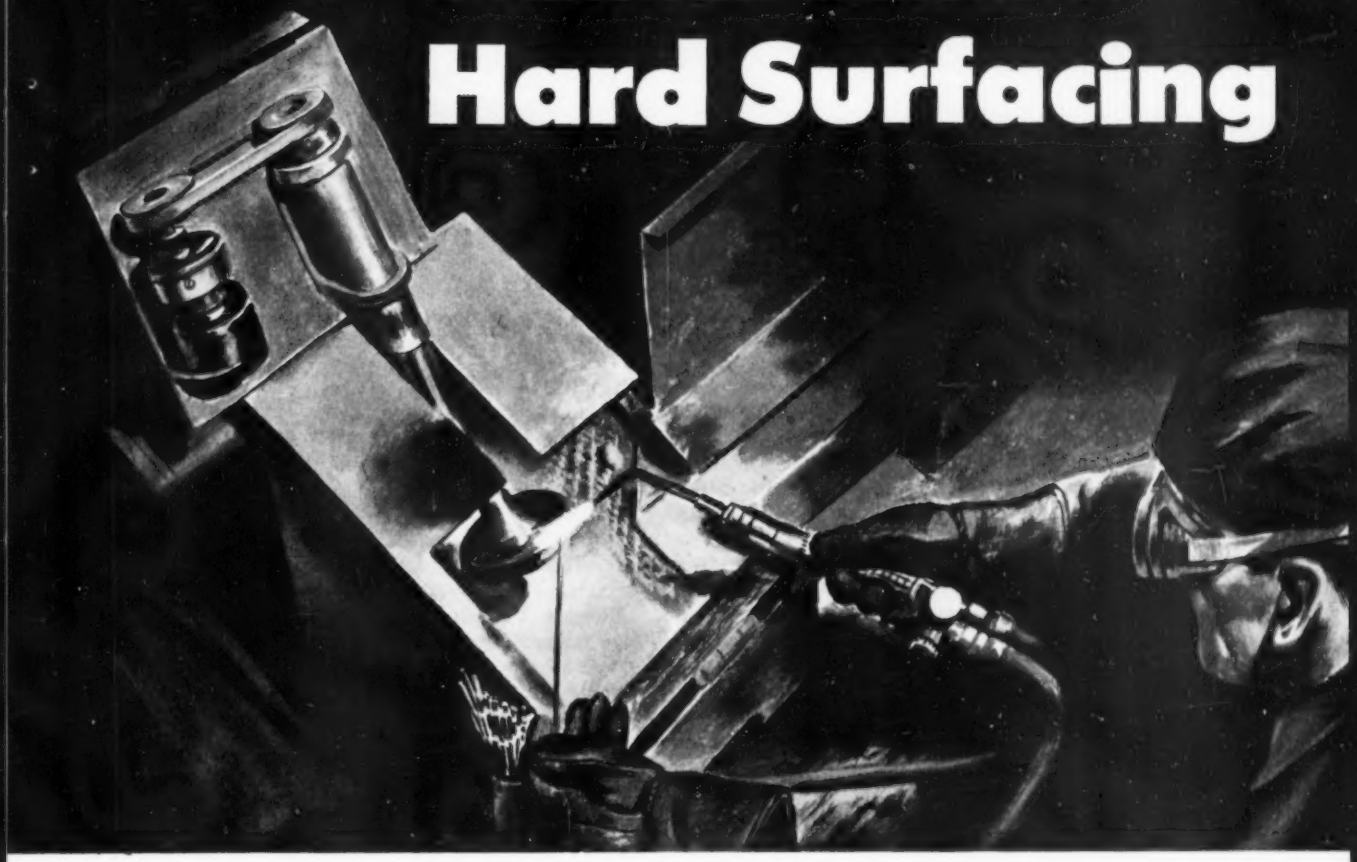
To illustrate how accurately this method can be used without injury to the steel or the machined finish, consider the shaft shown below. This is driven at 1800 rpm by a 250-hp motor, direct connected. Several of these have been treated at our shop by the flame method, with excellent results.



The shaft is held between centers, (should no centers be provided, it can be chucked at one end and a steadyrest used at the other end) and a dial indicator placed under the runout location of the shaft. In this case the shaft is bent at the shoulder against the 4-in. dia. Rotate the shaft to find the high spot and leave this in the top position. The runout is found to be 0.012 in. total indicator reading. Therefore, we set the indicator at 0.012 in. before zero. If the diameter at this point is large enough, the indicator can be left in place without harmful results from the torch, or a plate may be placed across the ways of the lathe to facilitate removing and placing the indicator. Apply heat at *A* and watch the indicator go to 0.012 in. past zero, or over. Stop heat and let cool. The result, let us assume, will be 0.006 in. Repeat the procedure until you obtain the desired limits. It is possible, with a little practice, to come within 0.0005 in. full indicator reading, and the piece will not be marred. It may happen that you will go past the limit, in which case, the treatment will be the same, but with heat position reversed.

This method has been used successfully on motor shafts of various sizes wherever the distortion is not too severe. How far you may go with it can be learned through a little experience in your own particular field.

A PRACTICAL MANUAL OF
Hard Surfacing



BY STEVE ELONKA, Associate Editor, POWER

The difference between a piece of new equipment costing thousands of dollars and one that's ready for the scrap heap is often no more than a few pounds of metal worn or corroded from critical places. By applying tough alloys to spots that take a beating, you can lick these losses.

Hard surfacing was never more valuable than today, when new equipment is expensive. Used in the manufacture of new products, it boosts working life many times, but its greatest field lies in the realm of maintenance, where it is a potent weapon in reducing costs. Not only can hard facing restore worn parts — it can give them a life expectancy far greater than that of untreated new ones. And every day, it seems, manufacturers of hard-facing equipment and alloys come up with new methods and materials designed to give better results and to cover a wider range of metals.

This Special Report, recently published in the McGraw-Hill magazine, *Power*, tells you what you need to know to cash in on this timely cost-cutting process — what hard facing can do, and how to put it to work in your plant.

American Machinist SPECIAL REPORT NO. 342 TO THE METALWORKING INDUSTRIES

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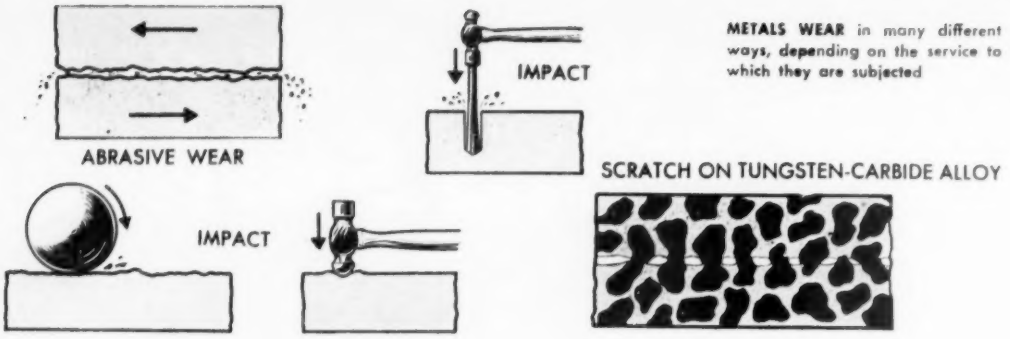


METALS WEAR in many different ways, depending on the service to which they are subjected

WEAR...AND WHAT YOU CAN DO ABOUT IT

WE TALK about "hard" facing to fight wear, and *hardness* is certainly a key factor. But there's more than one kind of wear and more than one way of licking it. So, before getting into the business of applying wear-protective surfaces, let's take a look at both wear and hardness—what they are and how they tie together.

WEAR

Abrasive wear is caused by one material scratching another. This occurs when two materials of different hardness slide over each other. A burr on a steel shaft, for example, scratches a groove in softer babbitt or bronze bearing metal. And, of course, the shaft wears a little, too.

Galling may oocur when two metals of about the same hardness rub together without lubrication. For example, driving a steel pin in a hole in steel. If the pin fits tightly and isn't lubricated, it may stick because of "cold" welding. Forcing the pin out leaves some metal pulled out of the hole wall and welded to the pin. This shows up as galling.

Impact wear takes place when one material strikes another. A star drill wears a hole in granite because the tiny granite particles are loosened by constant impact when the drill is driven against it. By turning drill slightly after each blow, the tiny particles keep loosening, thus deepening the hole. Same thing happens when steel balls revolve on granite under pressure. But if the star drill is revolved by an electric drill instead of being hammered, wear is abrasive, and is mainly on the drill.

Hard materials resist abrasive wear. For example, sand wears soft metals quickly. Under the same conditions, it wears hard metals more slowly.

Hardness Isn't All. You can't rely entirely on hardness comparisons as a measure of wear resistance. A piece of hardened steel may give a higher hardness reading than a deposit of tungsten-carbide, for example. But the latter resists wear better. Why? Tungsten-carbide consists of almost diamond-hard carbide particles in a softer matrix. Most measuring methods give an average of the two hardnesses. But when it comes to actual wearing action, say by quartz, the quartz will cut a groove across the soft matrix but slide over vastly harder carbide particles.

What's Underneath? Surface properties play the biggest part in resisting abrasive wear. But resistance to impact wear is more than skin deep. You need a tough material to absorb the shock, or one that gives enough to distribute high compressive loads. Rubber, for example, may be superior to some metals. It cushions the blows, spreads the effects over a wider area. And the final unit load is usually low enough to leave the rubber unharmed.

The same thing is true with ductile metals. A blow or a compressive load deforms the metal, spreads the stress without exceed-

ABRASIVE WEAR takes toll of Archimedean screw for conveyor. Note worn areas under welder's elbow. Hard facing with abrasion-resistant alloy keeps the conveyor on the job longer

ing maximum strength, as on a less-ductile metal.

Corrosion. So far, we've been talking about what might be called mechanical wear. Corrosion is electrochemical in nature, and pretty complex. Yet its net effect is a loss of material from the surface, and it causes the same kind of maintenance headaches as abrasive and impact wear. Because it's a surface problem, you can cure many of these headaches by protective surfacings. Many hardfacing alloys contain chromium, which builds corrosion resistance. Where corrosion is the chief problem, there are some special alloys, like the stainless-steel types, which contain both chromium and nickel.

HARDNESS

We've mentioned hardness several times, but we haven't really defined it. Trying to do so is a good way to start an argument. Resistance to indentation, deformation, cutting, scratching, all fit into the picture. For most practical purposes, we use either resistance to indentation or to scratching to measure hardness.

Brinell Test. Metals are often tested by indentation, and the Brinell method is widely used. A hardened steel ball is forced into the metal at a given pressure. Width of the depression is the measure of the hardness.

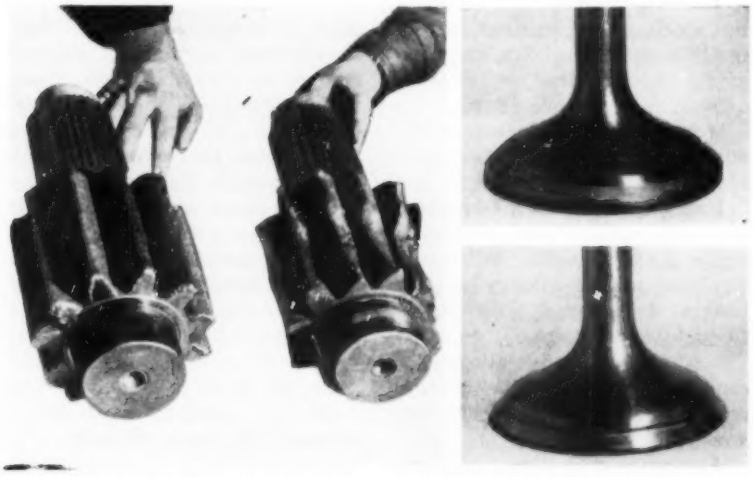
Rockwell Test. Because the Brinell ball deforms on hard surfaces, it has certain limits. The Rockwell tester uses a diamond cone on *C* scale, ball on *B*. Degree of hardness, as indicated by depth of depression, is read directly from circular scale on gage. Tester has two scales: *C* for hard metals, *B* for softer ones.

Scleroscope. In this tester, a weight with a hard round end falls 10 in. through a vertical glass tube. Height of rebound from sample is a measure of hardness. Tube is marked with a 140-part scale: 130 on scale is hardness of glass, hardest steel runs about 110.

Moh's Scale shows scratch hardness, with ten minerals as standards. But steps in scale aren't equal. Difference between No. 9 (corundum) and No. 10 (diamond) is about as great as between No. 1 and No. 9.

Handy Field Test. It's not usually practicable to make real hardness tests while doing maintenance welding. But you can use the file test up to about 500 Brinell, which is about 50 Rockwell C. Use a new machinist's hand file, exert steady pressure on file with both hands.

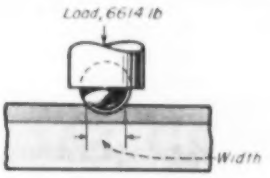
Conversion chart, gives a good idea of equivalent values on the several hardness scales. Comparison isn't exact, and conversion charts differ, because metals aren't uniform and react differently to each test method.



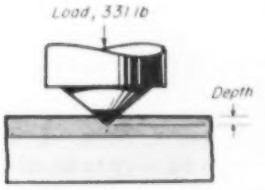
PINION GEAR (right) worn out in service, (left) after hard facing but before finish machining

VALVES operated 1500 hr in same diesel have hard facing, lower, unworn

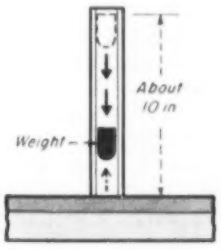
COMMON HARDNESS TESTS



BRINELL TEST



ROCKWELL TEST



SCLEROSCOPE TEST

HARDNESS-SCALE EQUIVALENTS

Rockwell scale C	Brinell scale	Sclero-scope	Moh
72	772	106	
70	760	102	8.5
69	755	98	
68	740	96	
67	725	94	
66	712	93	
65	699	92	
64	685	90	
63	672	89	8.0
62	657	86	
61	645	85	
60	631	84	
59	617	—	
58	603	81	
57	590	—	
56	577	78	7.5
55	562	75	
54	550	74	
53	536	73	
52	523	—	
51	510	71	
50	497	68	
49	486	—	
48	473	66	
47	462	64	7.0

HANDY FILE HARDNESS TEST

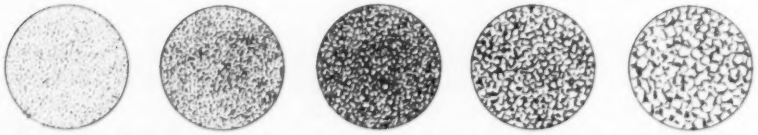
Brinell hardness number (approx)	
100	Metal removed easily by file
200	Slightly more pressure needed on file to remove metal
300	Metal shows resistance to file
400	Takes more pressure on file
500	File removes almost as metal
600	Metal cannot be filed

Steel can, of course, be made harder or tougher by heat treatment or casehardening, but this can be done, as a rule, only to new parts. Parts already in service, perhaps already worn, present a different problem, and for the answer to this we can turn to . . .

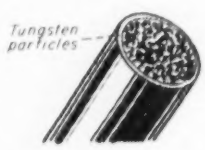
HARD FACING...APPLIES ALLOYS TO THE SURFACE

As we generally use the term, *hard surfacing* (hard facing for short) involves applying an alloy coating to a metal part. The facing alloy is usually chosen for wear resistance, but other factors, such as corrosion, may enter the picture. Hard facing is widely used in production. But one of its great advantages lies in its suitability for maintenance work — protecting parts exposed to tough wear conditions and building up parts already worn.

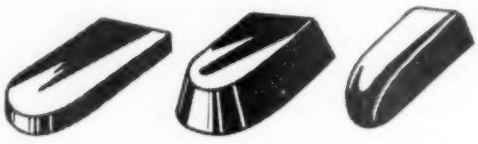
Hard-facing alloys are most often applied by electric arc or gas torch, but there are several other methods particularly suited to some types of alloys and specific applications.



CRUSHED CARBIDES come in bulk, in screen sizes shown. Almost as hard as diamonds, they are employed for unfinished surfaces requiring extremely high abrasion resistance



CARBIDES also come in tubular welding rods, like this



INSERTS, or blanks, of tungsten carbide are supplied in a variety of shapes for brazing or welding to the base metal

Which Metals? While most common metals can be hard faced, there are some exceptions, and in many cases you have to know just how to do the job. Here's a rundown on familiar metals—what you can and can't do:

Low- and medium-carbon steels (less than 0.5% carbon) can be hard faced by electric arc or by oxyacetylene.

High-carbon steels (more than 0.5% carbon) can also be faced by arc or torch, but you may have to heat treat some jobs before and after facing to remove hardness and brittleness, prevent cracking.

Low-alloy steels are in about same class as carbon steels. Depending on composition, you may need to heat treat.

Manganese steels (11-14% manganese) are built up by the electric arc. Cool base metal to avoid overheating. After applying welding heat uniformly, peen deposit with machinist's hammer to relieve cooling stresses.

High-chromium and chrome-nickel steels, worn in service, may be restored by electric arc and torch. Be sure to know the properties of each type you work on. Heat evenly and cool slowly to prevent warping or cracking, because most steels of this class have a high coefficient of expansion. Doing the job right and knowing the metal's composition helps avoid brittleness and loss of the facing's corrosion resistance.

Gray and alloy cast iron: When facing with arc or torch, watch thin edges. Cast iron's lower melting point makes thin edges likely to melt off.

Malleable iron can be hard faced, but welding heat hardens iron directly under facing. You may have to remove hardness by reheating finished job to above 1500 F.

Monel metal hard faces easily and gives no trouble with ordinary care.

Brasses and bronzes, along with some other nonferrous alloys, are easily surfaced with similar copper-base metals. Heavy sections preheated to a red glow can be faced by electric arc.

Copper and copper alloys conduct rapidly and have low melting points. Method used with brass may work.

Aluminum and aluminum alloys cannot be hard faced.

Comparative Ratings. With so many alloys on the market to help solve almost every problem, the American Welding Society prepared the accompanying table, Comparative Ratings of Surfacing Alloys. Ratings are given on a scale of 10 to 100: 100 means you can expect the best possible wear, while 10 usually gives the poorest for service shown.

How to Select Alloy: While all the many wear problems cannot be shown, table does include most general cases, with nearest general solution. Most severe services take in a number of conditions, so choosing right alloy depends on over-all or combined use, rather than special need for one specific condition.

For some problems, this table may not give the best solution. In such cases, look for things of little importance that may be troublemakers. For instance, effect of chemical corrosion is not shown in table though, in some cases, it may be chief cause of failure.

Except under such unpredicted conditions, table does help choose an alloy, or group of alloys, that comes nearest to doing best job —under all setups.

Some services need high hard-

COMPARATIVE RATINGS OF SURFACING ALLOYS

	Hardness	General atmospheric corrosion resistance	Resistance to earth abrasion	Resistance to hot deformation	Service under heavy abrasion	Service in sliding and rolling wear*
I. Ferrous						
A. Hardenable Alloys						
1. Carbon Steels						
a. Low	10	10	10	10	10	20
b. Medium	10-40	10	10	10	10	50
c. High	20-60	10	20	10	10	50
2. Low-Alloy Steels						
a. Low carbon	10	10	10	10	10	30
b Medium carbon	20-40	10	10	10	20	50
c. High carbon	20-60	10	20	20	20	50
d. Cast-iron types	20-60	10	40	20	20	40
3. Medium-Alloy Steels						
a. Medium carbon	20-40	20	20	30	50	60
b. High carbon	30-50	20	40	50	80	60
c. Cast-ion types	30-70	20	50	60	50	40
4. Medium-high Alloy						
a. Low carbon	20-40	20-50	20	40	30	40
b. Medium carbon	30-60	20-30	40	50	70	60
c. Very high alloy	40-80	20-30	60	50	80	40
d. Cast-iron types	40-80	20-30	70	50	50	40
5. High-speed Steel	80	20	40	70	40	40
B. Astenitic Steels						
1. Chromium and Cr-Ni						
a. Low carbon	30	90-100	20	20	30	30
b. High carbon, low nickel	40	90-100	20	40	50	30
c. High carbon, high nickel	40	90-100	30	40	50	30
2. High manganese	40	50	20	20	80	50
C. Austenitic—not usually heat-treated						
1. High-chromium Iron	60	60-80	70	80	80	80
2. High-Alloy Iron						
a. 1.7% carbon	70	60-80	60	60	70	70
b. 2.5% carbon	70	60-80	70	60	60	80-90
c. very high alloy	80	60-80	80	60	50	90-100
II. Cobalt Base Alloy						
A. Low Alloy	40	90-100	50	100	80	90-100
B. High Alloy	70	90-100	70	100	60	100
III. Carbides						
A. Inserts	100	60-80	100	100	50	100
B. Composite	75-100	30-60	100		70	
C. Powder			100		70	
IV. Copper Base						
A. Copper-Zinc	20	60-80	20	10	10	80-100
B. Copper-Silicon	25	60-80	20	10	10	50-70
C. Copper-Aluminum	25-40	60-80	30	10	10	70-90
V. Nickel Base						
A. Nickel-Copper (Monel)	20	80-100	20	10	20	20
B. Nickel-Chromium (Nichrome)	30	80-100	40	70	40	60
C. Nickel-Chromium-Tungsten-Molybdenum (Hastelloy)	50	90-100	50	90	60	80

*In combination with suitable companion alloy

ness without being porous, yet must attain a high polish. For such uses, you can't always get the most wear-resistant alloys, which are the tungsten carbides. Reason is that deposits with these metals wear to a rough surface. It isn't always easy to machine or grind a perfect surface on carbide deposits because of the hard particles.

Where corrosion is a problem, use a rust-resisting or corrosion-resisting alloy. Often, corrosion resistance is main factor, or it may be combined with other problems, such as wiredrawing or sliding metal-to-metal contact. Table suggests several alloys for such cases. Look under Type II in table, or to the grades of brass, bronze or nickel alloys.

Resistance to hot-deformation is another need. For this, alloys must have high hot-hardness. Several types of alloys, such as Types I-C and II, will do. Also, some services need a high degree of toughness at high temperatures. Some alloys in high-nickel group, Types V-B and V-C, are best here.

Metal-to-metal sliding and seating wear is different from soil-to-metal kind of wear of earth-handling equipment. While hardness is important to lick galling and deformation, best resistance to such service is usually a combination of similar metals. For this reason, bronzes are very popular for sliding surfaces and on valve seats. These alloys come in various degrees of hardness because hardness is also often needed.

Corrosion may be important, as for corrosive liquids or even for water service. But this quality can be given by choosing the right alloy. Some of the high-copper or nickel alloys and cobalt-base, nonferrous alloys have excellent corrosion resistance, along with good sliding wear resistance.

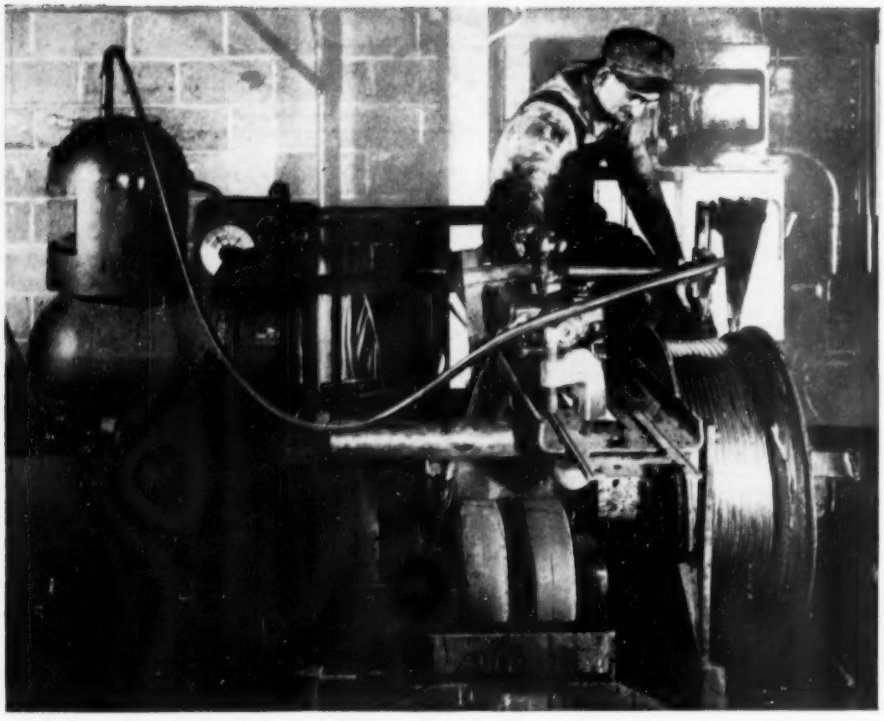
Where does cost of alloy come in? Well, often the ideal alloy is also the highest-priced. So weigh benefits gained by using costly alloy against service you would get from slightly inferior alloy, or cost of replacing worn parts altogether. It's the over-all picture that counts here.

MELTING POINTS OF METALS

Metal or alloy	Melting point F
Carbon	6332
Tungsten	6152
Tantalum	5160
Molybdenum	4532
Titanium	3270
Iron, wrought	2900
Iron, pure	2786
Chromium	2740
Cobalt	2700
Steel, less than 0.15% carbon	2700
Nickel	2646
Steel, stainless (18-8, low carbon)	2640
Steel, cast	2600
Steel, nickel 3½%	2600
Steel, medium, (0.15 to 0.40% carbon	2600
Silicon	2588
Stainless steel, (18% chromium, 8% nickel)	2550
Steel, hard (0.40% to 0.70% carbon)	2500
Nichrome	2460
Steel, manganese	2450
Steel, nickel, manganese	2450
Stellite (average)	2316
Iron, cast	2300
Iron, malleable	2300

SYMBOLS OF ELEMENTS

Aluminum	Al	Manganese	Mn
Argon	A	Molybdenum	Mo
Berryllium	Be	Nickel	Ni
Boron	B	Oxygen	O
Carbon	C	Silicon	Si
Chromium	Cr	Sulfur	S
Cobalt	Co	Tantalum	Ta
Columbium	Cb	Titanium	Ti
Copper	Cu	Tungsten	W
Hydrogen	H	Vanadium	V
Iron	Fe	Zirconium	Zr

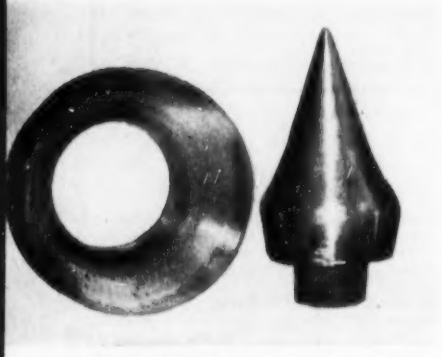


SUBMERGED ARC is semiautomatic. Bare electrode wire is power-fed through blanket of alloy flux. Alloy pick-up from flux gives up to 62 Rc hardness

DOING THE JOB:

1..ELECTRIC-ARC WELDING METHOD

Two major hard-facing tools are the electric arc and the oxyacetylene torch. The electric arc deposits alloys fast so heat doesn't penetrate deeply. But steel with more than 0.3% carbon may crack unless preheated. Because arc heat is intense, base metal melts near surface. This dilutes the first layer of hard-facing alloy with base metal —more than when a torch is used. It may take two or more layers to get undiluted hard facing.



NEEDLE VALVE for severe service is finished with cobalt-chromium, tungsten alloy

Hard-facing electrodes may be bare or coated. The flux coating reduces spatter loss, insures good penetration, prevents oxidation of deposited metal, and helps stabilize the arc. Flux makes base metal wet easily so weld metal flows and diffuses through melted flux. It also helps carry flame-produced oxide to the surface so it doesn't remain to contaminate the hard-facing material.

Current Settings. If you don't have electrode maker's data, use the table below as a handy guide:

Rod-size, in.	*Current, amp*
⅛	80 to 110
3/16	150 to 200
¼	200 to 350

Low or medium current with a short arc of about 3/16 in. prevents loss of alloying metals. It also reduces dilution of alloy by giving minimum penetration. Increasing current increases penetration, softens deposit, and increases dilution with base metal.

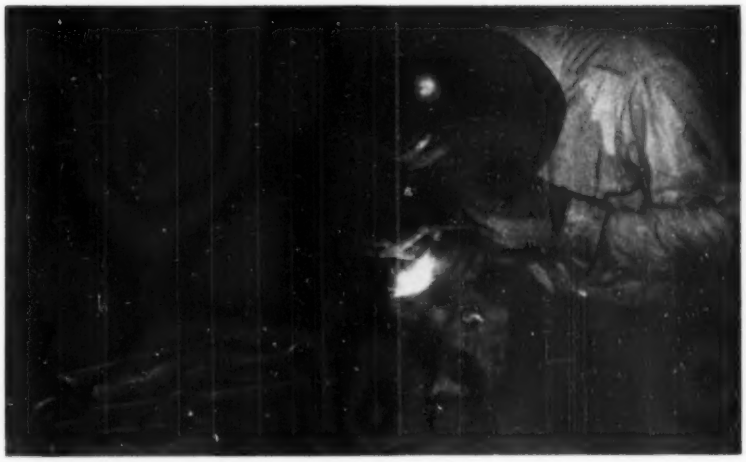
Electrode size depends on nature of work and current it is to carry. Because the electrode acts as an electrical conductor, be sure to use the correct current for each size electrode.

Good rule is to use largest convenient rod for the job. Large electrodes permit faster work because more metal is deposited.

They are cheaper and faster and their arc stability is often greater. But if material is crack-sensitive, use a small-dia electrode. That reduces heat input and also danger of distortion.

Use only dry electrodes. Best way is to make sure they are kept clean and are stored properly in a dry place. When using, be sure to avoid trouble by following the manufacturer's directions. Better hard-facing jobs will more than pay you for your trouble.

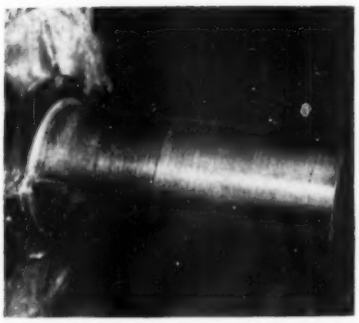
Submerged arc increases depositing speed 3 to 4 times because high current density with small wire gives high burnoff rate. For example, 600 amp on 5/64- or 3/32-in. wire is equal to 100 amp on 5/16-in. electrode. Alloy pickup is from granular flux, containing alloy needed, as flux pours from funnel and hides arc. Inexpensive wire can thus make hard-facing deposits of 36 to 62 Rc.



SWING-ARM BRACKET, badly worn by use in dusty location can be restored to serviceable condition by hard facing

Twin carbon arc has two carbon electrodes in holder, gives softer arc and will hard face thin materials without burning through. Reason is that current flows from tip of one copper-coated and cored carbon to other, not through metal being surfaced.

HOW TO HARD FACE A WORN SHAFT BY ELECTRIC ARC



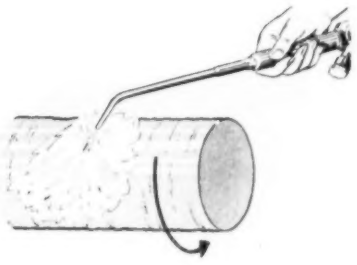
WEAR ON THIS SHAFT resulted from highly abrasive dust working into bearing

STRAIGHT POLARITY			REVERSE POLARITY		
Electrode dia, in.	*Current amp*	*Arc volts*	*Electrode dia, in.*	*Current amp*	*Arc volts*
1/16	20 to 40	17 to 20	1/16	20 to 40	17 to 20
5/64	25 to 50	17 to 20	5/64	20 to 60	17 to 21
3/32	30 to 80	17 to 21	3/32	30 to 80	17 to 21
1/8	70 to 120	18 to 22	1/8	80 to 130	18 to 22
5/32	120 to 170	18 to 22	5/32	120 to 180	18 to 22
3/16	140 to 240	20 to 24	3/16	140 to 250	20 to 24
7/32	170 to 300	21 to 25	7/32	170 to 300	20 to 24
1/4	200 to 350	22 to 26	1/4	200 to 400	20 to 24
5/16	250 to 450	23 to 27	5/16	250 to 500	22 to 26

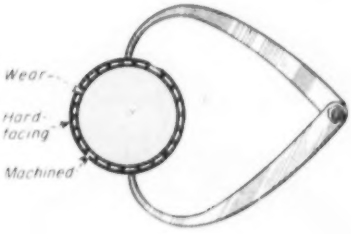
BUILD UP SHAFT with Type 1, A, 2 rod having less than 20% alloy. For abrasion resistance, finish with Type 1, A, 4 with more than 20% alloy

Getting ready

1 Clean shaft with safe solvent, such as trisodium phosphate, rinse and dry



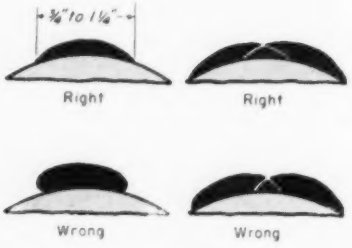
2 With a gas torch, preheat part to be coated—just enough to remove chill



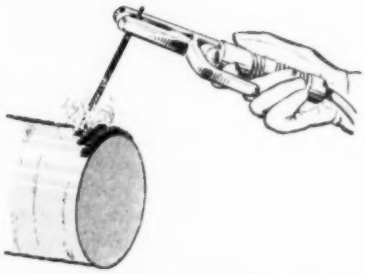
3 Set calipers for finished size, plus 20% for machining and shrinkage

Applying the facing

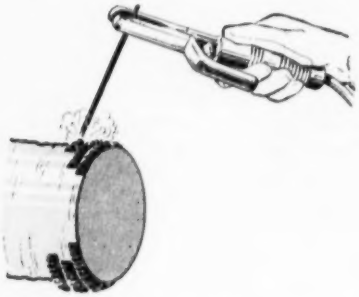
4 Ventilate well if the welding must be done inside some confined space



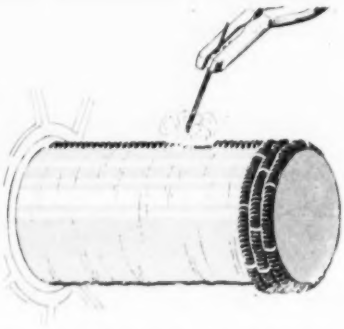
5 Bead must be spread, as shown. Be sure it overlaps to avoid porosity, slag



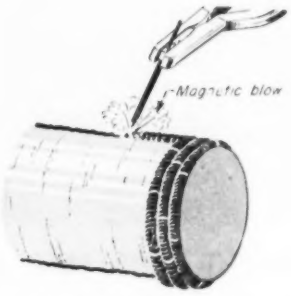
6 Run two or three beads around circumference for few inches at shaft end



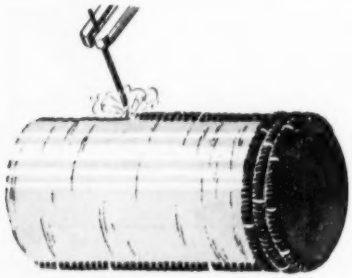
7 Turn shaft around and run some beads on other end to spread heat evenly



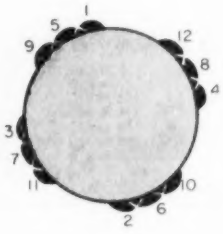
8 Run bead along shaft. Start from outer edge and work in from the end



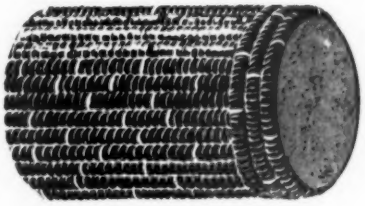
9 If you have magnetic arc blow with dc, change to ac; start at other end



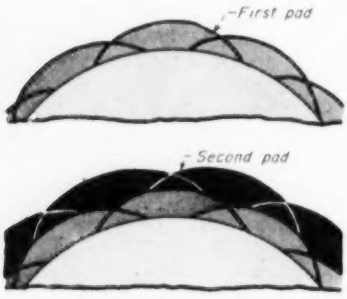
10 Run next bead on opposite side of shaft to distribute heat evenly



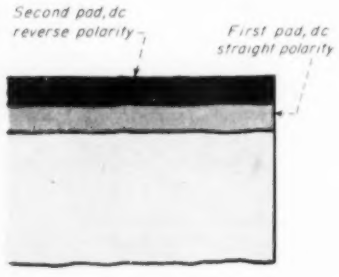
11 Use bead sequence shown to prevent shaft from distorting permanently



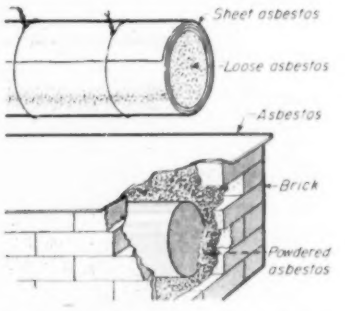
12 Stagger the end beads all around the shaft, as shown, to strengthen pads



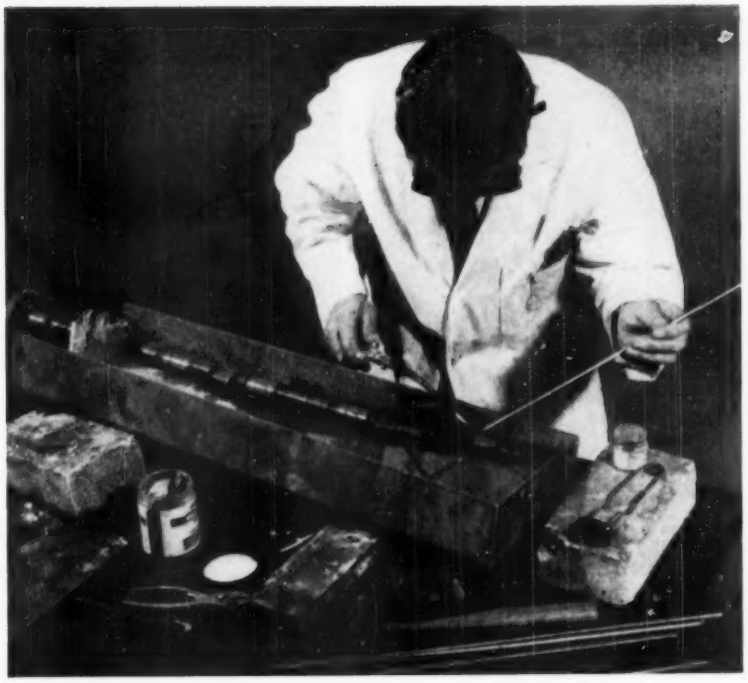
13 Lay second pad, with Type 1, A, 4 alloy; put beads between first ones



14 First pad takes dc straight polarity, second pad, reverse polarity



15 Cool slowly by covering shaft with sheet or powdered asbestos, as shown



WORN CAMSHAFT lobes are built up with torch. Water keeps shaft from warping by carrying away heat. This repaired job will last much longer than a new shaft

DOING THE JOB continued

2..OXYACETYLENE TORCH HANDY FOR CLOSE-TOLERANCE PARTS

Big advantage of surfacing by oxyacetylene torch is that surfacing alloy can be applied by flowing alloy onto the base metal with a technique known as sweating or tinning.

These terms describe formation of a lower-melting-point element that enables alloy to flow onto base metal while hardly melting it.

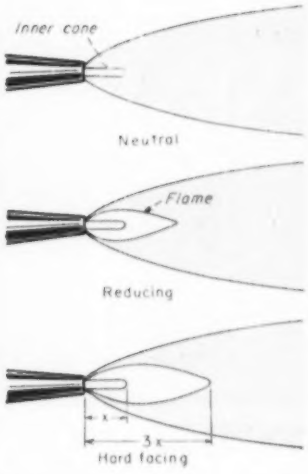
Term "sweating" refers to action that takes place when applying high-melting-point ferrous, nickel and cobalt-base alloys because of using an excess acetylene flame. This flame carburizes the surface of base metal, which in turn lowers melting point of the film. Alloy flows easily over this thin liquid film.

Term "tinning" describes action when surfacing with bronze or copper alloys. Only here it's more like a cleaning action caused by flux or flame that prepares base metal ahead of the welding action. That allows capillary flow of low-melting-point alloys onto the higher-melting-point base metal.

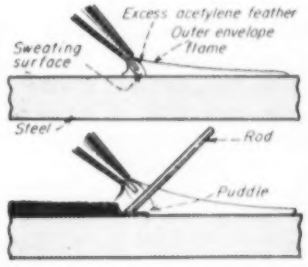
Flame Types. To burn acetylene gas completely takes 2½ times its own volume of oxygen. But about equal volumes of the two gases are fed through the torch. Other volume-and-half of oxygen is gotten from the air. The combustion of acetylene in oxygen produces carbon monoxide and hydrogen. Oxygen for burning the CO and H_2 to carbon dioxide and water vapor comes from the surrounding air.

Hard-facing flames usually have an excess of acetylene. Accompanying sketch shows a neutral flame —equal volumes of acetylene and oxygen going into the torch. Increasing the acetylene builds up a white flare caused by unburned

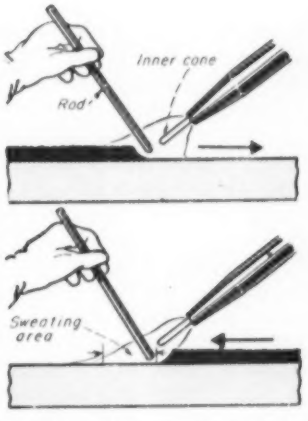
RIGHT FLAME AND WELDING METHODS FOR JOB



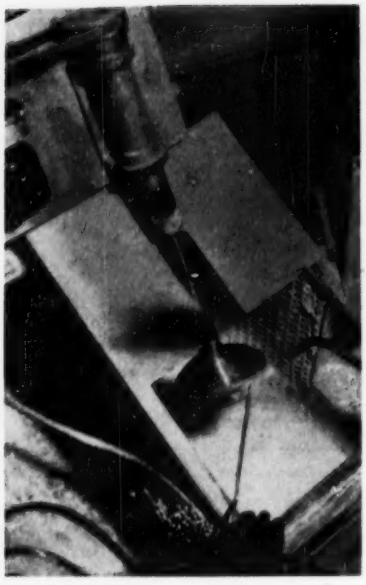
CARBURIZING: The flame welds but hardly dilutes facing alloy



SWEATING (top): Relationship of the tip, rod, and base metal



BACKHAND (top), or forehand depends on welders preference



VALVE FACING SETUP uses small electric gear-motor to rotate work under torch

EXCESS hard-facing metal is wiped away from sprocket teeth while still plastic

DIE FORMS accurate tooth contour when applied to plastic metal, avoids grinding

OXYACETYLENE TORCH *continued*

white-hot carbon particles. These free-carbon particles tend to carburize the surface of the base metal and also to reduce any oxides present to the metal form. So excess-acetylene flames are also called curburizing flames and reducing flames.

The usual hard-surfacing flame has a white flare about three times as long as the inner cone. This gives good sweating action because the free-carbon particles are absorbed into the base-metal surface, lowering its melting point. Melting of an extremely thin surface layer provides a liquid medium on which molten facing alloy flows. Carburized base metal, to a depth of about 0.001 in., is absorbed by alloying with the molten hard-facing layer. So gas-welded deposits can be made with penetration less than 0.010 in. into the base metal.

How Much Acetylene? Excess-acetylene flame also prevents loss of carbon content from welding rod and may even increase carbon content of weld deposit from 0.2 to 0.4%. Because some alloys absorb carbon from flame, hardness of deposit depends on excess acetylene used, and on cooling rate of finished work. But long excess-acetylene "feathers" are unsatisfactory because they are not as hot, put too much carbon into deposit, and make poor welds.

Always keep inner cone from touching molten metal already deposited. Inner cone contacting puddle puts in too much carbon. That hardens deposit and might cause cracks. Keep inner cone tip 1/16 to ⅛ in. away.

A slight reducing flame is used with rods having fairly high iron content, where dilution of facing alloy with base metal is not serious. When working on cast iron, watch corners and sharp edges, because cast iron has a lower melting point than many hard-facing rods.

When hard surfacing with the gas torch, use only a slight excess of acetylene. Use flame to keep air from contact with molten metal. This prevents oxidation. Never remove flame completely until metal starts to solidify.

Which Way? Deposit hard-facing alloys with either forehand or backhand technique. Forehand is usually recommended because penetration is controlled more easily and rod is deposited faster with less scale in molten pool.

Backhand technique is common with the sweating method. Direct excess-acetylene flame at 30 to 60° angle to the surface. As you deposit alloy, move flame back to remelt rough spots, get a smoother finish.

Typical Job. Torch method is handy for doing parts that will be finished to close tolerances by machining or grinding. Camshaft of internal-combustion engine is a typical job. To repair worn lobes, partly submerge shaft in water so heat is carried away and shaft doesn't warp. Heat can also be removed by packing wet asbestos around shaft, building it up to area being surfaced.

Set torch to carburizing flame and hold against cam lobe until metal sweats. Extent of sweating area depends on size of welding tip, but it should extend a distance of ¼ in. around excess-acetylene flare.

Withdraw flame enough so end of rod is between flame's inner cone and the hot base metal. Apply rod to sweated area, with tip of inner cone just touching rod. As

rod melts, a pool forms, flowing over sweating area. Remember: Base metal is too cold if first few drops don't flow evenly.

Remove rod from flame and flow molten pool where wanted by playing flame on it. Return rod to flame and melt off more metal into pool. Keep flame on front edge of molten pool so flame keeps it molten and also sweats base metal in front of pool. Move rod in and out of flame as it moves steadily forward. Float off scale specks, don't cover them up.

Keep supplying the pool from the rod as the pool flows forward. Use rod so it deposits molten metal uniformly at a steady rate over area to be covered. On round work, this is easier if work is turning. Play the flame over the deposited alloy from time to time to remelt and smooth out any high or low spots.

DOING THE JOB:

3..SPRAYING METHODS USE ALLOYS IN POWDER OR WIRE FORM

Many alloys may be sprayed on by one of several methods. Spraying gives a thin, uniform coating—from a few thousandths thick up to 0.60 in. Contours and shapes are easily coated. Spraying also handles alloys not easily applied in rod form.

In one method, alloys are sprayed from a suitable gun, then fused with a torch. In another, powdered alloy and plastic binder form a wire that's fed through a typical metalizing gun. Resulting deposit is then fused. Still a third way uses a special torch to apply a coating and fuse it in one step.

Spraying Alloys in Powder Form

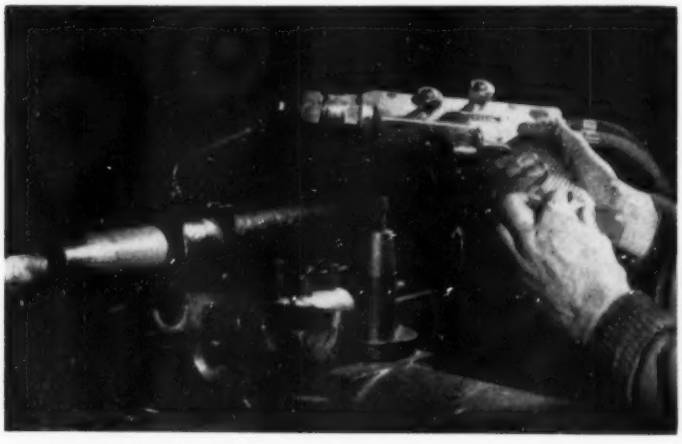
Powder spraying is done with a gun roughly like that for metalizing, but with a powder hopper and a carburetor for mixing powder with air. This applies alloy but does not fuse it. A separate torch is used to fuse sprayed alloy to base metal. It can also be done in a furnace or by induction heating.

Typical Job. CRS shaft in accompanying illustration wears badly in center. First, undercut it so there is at least 0.030 in. for hard facing all around. Never make sharp corners in groove, or oxide film will develop porosity when fusing, and the coating will peel back.

Blast with angular-steel or aluminum-oxide grit, not round shot. Caution: Don't touch base metal. If it must stay in lathe overnight, cover it.

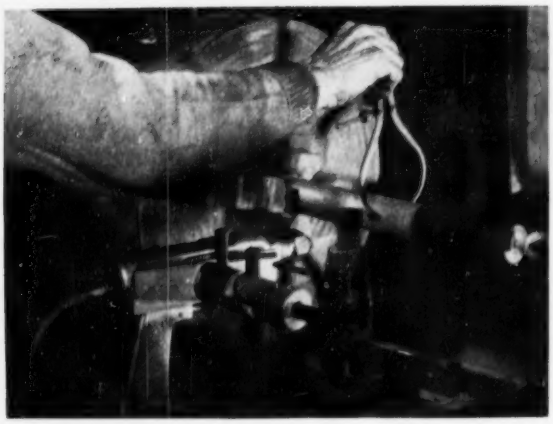
In lathe, blow shaft with compressed air while it revolves, then wire-brush. Adjust to neutral flame of 13-psi oxygen and 11-psi acetylene. Have 75-psi air pressure to propel powder.

Spraying. Turn on powder, then open gun's trigger and build up corners of undercut, holding gun in hand. Next, set gun in holder attached to toolpost and adjust so spray is against shafts' center. Start thread-cutting feed and reverse at end of each stroke. This sprays even layers of alloy. Spray on enough alloy to allow for shrinkage. This depends on coating thickness. Check with calipers.

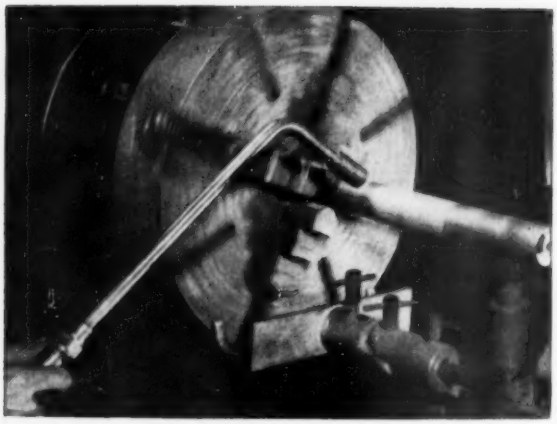


ADJUST POWDER and flame by valves on top of gun. Then press gun trigger to start powder spray

BUILD UP CORNERS of undercut by hand, while shaft revolves in lathe



RUN GUN BACK and forth, using lathe power feed, to build up deposit. Check occasionally for size with calipers



FUSE ALLOY to shaft by heating with a large gas torch at correct temperature, using a neutral flame

DOING THE JOB: *continued*

Fusing. With shaft built up to right diameter, use large torch with neutral flame. Play back and forth over revolving shaft, heating evenly. Then hold flame at one end until shaft has a transparent appearance. Move flame slowly along shaft as alloy shines under flame. Now alloy is fused to shaft. Remove part from lathe and drop into a box of powdered insulation for slow cooling overnight.

Unless cooled gradually, hot alloy shrinks faster than inside of shaft, and cracks. If alloy is inside a sleeve, fast cooling will have a tendency to pull the alloy away from the wall.

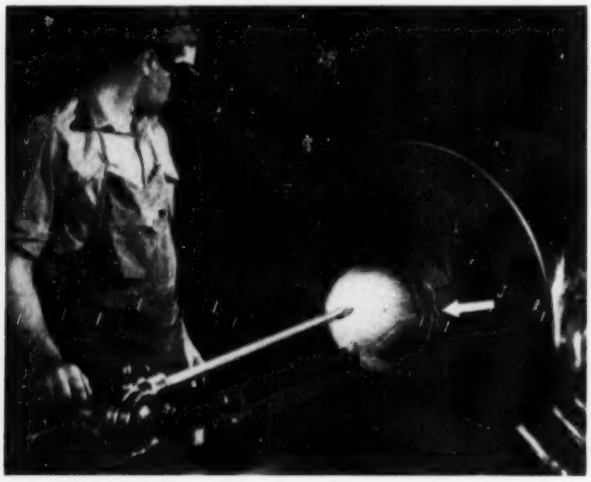
Spraying Alloys in Wire Form

Besides the many wires made for various metalizing jobs, hard-surfacing wire is made of powdered alloys extruded with plastic binder. Plastic evaporates in metalizing-gun flame, so only the alloy deposits on base metal. Alloys may be same as for powder spraying—only difference is that wire is deposited with usual metalizing guns.

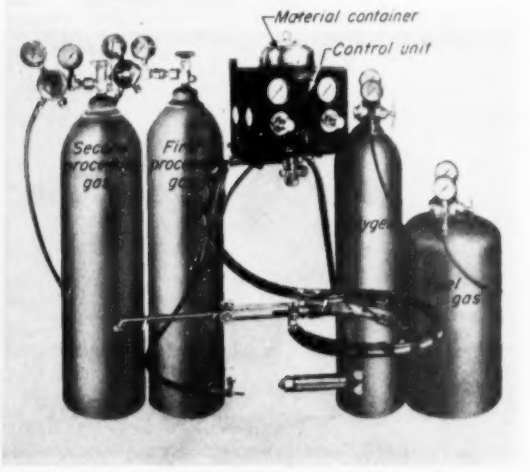
After spraying, deposit is similar to metalizing job, which means it's not fused. There are various ways of fusing: For small to medium work, use an acetylene torch. For larger work, use two or more torches, or put in a furnace.

Liner Job. Hard surfacing inside a gas-engine cylinder liner isn't a common application and is probably one of the toughest to do right. But cylinder will have from three to four times more life than when new.

First bake casting at from 450 to 500 F to burn oil out of cast-iron pores. This is important on old oil-soaked castings. Baking takes



WIRE BEING SPRAYED inside cylinder liner is powdered hard-facing alloy bound in plastic. Arrow shows Tempil-stick mark to indicate temperature



POWDERED ALLOY installation for depositing hard facing powder. Controls are needed for adjusting flow of various gases

about an hour, depending on heating method.

Bore out to get rid of ring steps, fluted wear and scoring. Finish bore with a No. 18 or 20 thread final cut for anchoring alloys. Then grit blast. Preheat from 200 to 300 F. Keep gas torches on outside to maintain this temperature while spraying.

Spraying. Metalizing tool is fed back and forth by lathe for smooth, even deposit. Spray cylinder up to original diameter, plus about 0.030 in. for finishing. Because alloy used here is over 50 Rc, and hard to machine, cylinder will have to be finished by grinding.

Fusing. After spraying, bring up to shiny red heat for fusing. For this job, a furnace is best, as it will give even heat at all parts of the liner. Then allow to cool gradually over a few days until room temperature is reached. If liner cools too fast, or unevenly, alloy coating pulls away from the liner. For most jobs, but particularly for one like this cylinder liner, slow, uniform cooling can't be overemphasized.

Spraying and Fusing Powdered Alloys in One Operation

This method feeds powdered hard-facing alloy onto the base metal through an oxyacetylene flame, as when spraying powder and wire. But here the process differs.

Powder, with flux if needed, is projected through the flame by an auxiliary gas, such as carbon dioxide, nitrogen, or hydrogen, by means of a spray gun specially designed for the purpose.

Continuous Fusing. Temperature of oxyacetylene flame is adjusted so deposit is continuously fused or braze-welded to the base metal. This makes the process something like oxyacetylene hard surfacing, as the base metal is prepared and must be preheated and treated in just about the same general way.

One advantage is that coatings as thin as 0.010 in. may be deposited. Up to 0.150 in. of coating has been applied. There is a full bond with base metal, as the deposit is completely melted without a second fusing operation.

Control. Accurate control of base-metal temperature is obtained by increasing or decreasing amount of flame, then proportioning the projecting gas (and alloy), and the processing gas. Both base-metal and alloy temperatures are controllable, all the way from melting temperatures down. This gives a high-quality metal-bonded hard surface.

Equipment. Torch resembles usual welding torch but has three control knobs on the handle These are part of a total of 16 controls on the apparatus for accurate regulation of all operating conditions. Torch also applies plastics or synthetics.

Alloys containing beryllium, bismuth, carbon, cobalt, molybdenum, tungsten, may be deposited with this equipment (not yet commercially available to the industry).

4..SPREAD ALLOY AS IF ICING A CAKE

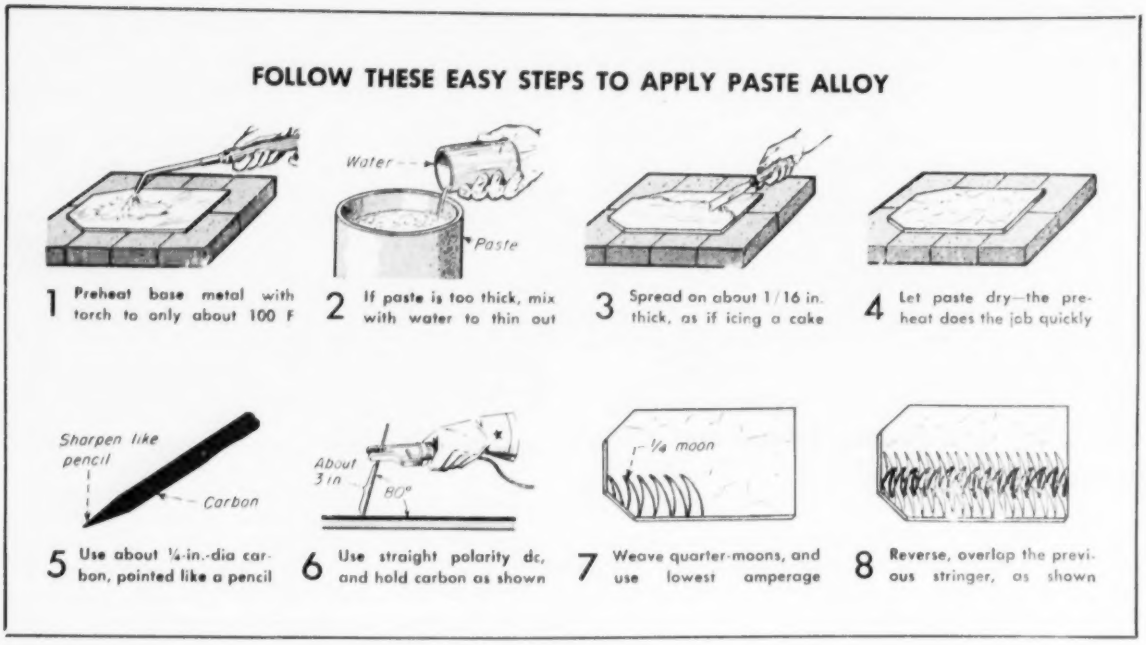
Some hard-facing materials come in paste form. One of these is chromium boride, which reads 68 to 72 Rc. It has good resistance to extreme abrasive wear found in materials-handling chutes, fan blades, pump impellers, scraper blades, crusher rings, and screw conveyors.

In addition to resisting abrasion, chromium-boride is good against corrosion and impact, has hot-hardness qualities. It's easy to apply by carbon arc or oxyacetylene torch.

Applying Paste. Clean base metal thoroughly. If there's scale or rust, remove by grinding, shot blasting, or sanding with abrasive cloth. Amount of preparation needed depends on previous service of material to be coated. Watch out for problems like oil-soaked castings. If not baked out, oil can cause hard-surfacing job to fail.

Ordinarily, preheat the work to about 100 F. Play oxyacetylene

CHUTE FOR ABRASIVE MATERIALS, hard faced with chromium boride crystals applied in paste form, will last about eight times longer


FOLLOW THESE EASY STEPS TO APPLY PASTE ALLOY
Water
Paste
1 Preheat base metal with torch to only about 100 F
2 If paste is too thick, mix with water to thin out
3 Spread on about 1/16 in. thick, as if icing a cake
4 Let paste dry—the preheat does the job quickly
Sharpen like pencil
Carbon
About 3 in
80°
1/4 moon
5 Use about ¼-in.-dia carbon, pointed like a pencil
6 Use straight polarity dc, and hold carbon as shown
7 Weave quarter-moons, and use lowest amperage
8 Reverse, overlap the previous stringer, as shown

DOING THE JOB **continued**

flame or blowtorch back and forth across piece so it heats up slowly and evenly.

Paste comes in cans, mixed with water. If it's too thick, add water and stir to the right consistency. Then spread it on metal with a putty knife, a stiff brush or a piece of wood. Coating thickness runs about 1/16 in. Putting on the paste is much like icing a cake. Next, let paste dry. The preheat evaporates the water quickly.

Sweating. If metal to be coated is 14-gage or less, use oxyacetylene or carbon arc torch. Spread paste about 1/64 in. Heat base metal up to sweating temperature. Fusing of base metal and paste will show as a dark line ahead of the torch flame. Move torch across work, keeping the dark line ahead of the flame.

For metal over 14-gage, use standard carbon electrode of 3/16, ¼ or ⅜-in. dia, depending on thickness of base metal. Have straight polarity with just enough current to maintain arc. Hold carbon about 80° to the vertical.

Using Carbon Arc. Work with a quarter-moon weaving motion, not over 2½ times diameter of carbon. Point carbon in pencil sharpener or by holding against grinding wheel. If handled right, carbon melts so point stays as it should. Have about 3 in. of carbon sticking out of holder.

Keep black spot of carbon floating on the surface just in front of the point. After sweating-on first weave, pass across work and return with about half the width of the second weave overlapping the first. If you get porosity on the edge of the weave, pay no attention. It will disappear when you overlap the next weave.

Use paste made of chromium-boride crystals only on rough work that is not to be finished.

Sweating-On Powder. Chromium carbide comes as a powder, mixed with flux. Sprinkle it on the base metal and fuse with a carbon arc or carbon arc torch for a smooth, dense, abrasion-resisting surface, which can be as thin as 0.025 in.

Hardness depends on mixing with base metal, runs about 54-61 Rc for one layer and 57-63 for second. Deposit develops full hardness in resisting scaling at high temperatures. Corrosion resistance is like that of stainless steel. Don't use this type where impact is great.

5..BRAZING TUNGSTEN-CARBIDE PLATES

Diamond-substitute alloys Type III, A come as inserts of various shapes. Some contain 90 to 95% tungsten carbide. Remaining 5 to 10% may be nickel, cobalt, iron or other elements, depending upon the properties called for in the work.

Braze these carbide plates to wearing surfaces because brazing heat (torch flame) will not melt the carbide materials. They wet easily, so present no difficulty in bonding securely to metal surfaces.

Because stationary and moving grinding pegs of the coal pulverizer shown in the illustration take heavy punishment from impact and abrasive wear, they are hard faced with

STEPS IN BRAZING TUNGSTEN-CARBIDE INSERTS

1 Grit-blast the tungsten-carbide inserts to remove the surface oxides and other films. Machine surface of the base metal, then do a thorough degreasing job

2 Flux surface of the base metal with brush. Before fluxing, clean in carbon tetrachloride. Degreasing, cleaning, and grit-blasting must be done properly

3 Position silver-solder strips after fluxing. Place one strip on base metal, a copper screen on the solder strip, and second solder strip on copper: then flux

4 Put the tungsten-carbide inserts in place on top of sandwich of silver-solder strips and copper screen. Six inserts are butted together on this job

5 Heating to 1350-1400 F by the propane-air burners against underside of base metal bonds the inserts. Test bond by tone of hammer blow, as shown

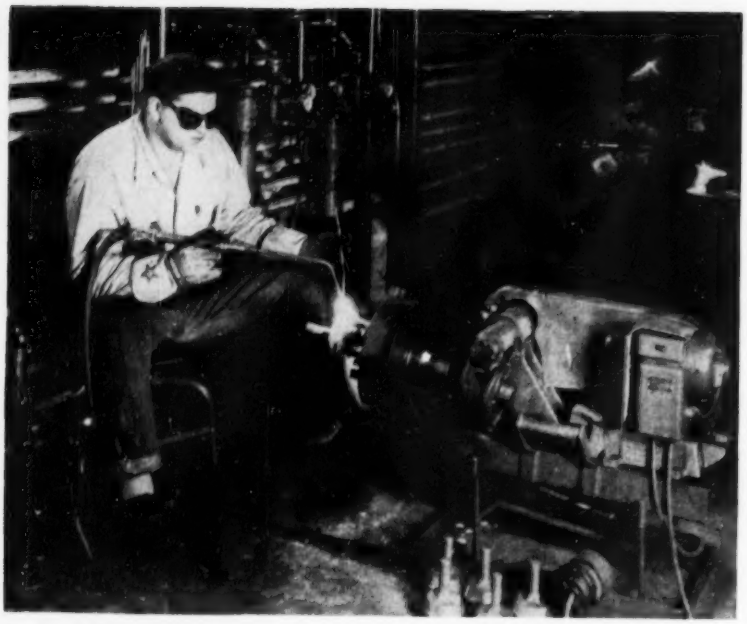
6 Attaching hard-faced peg to moving rotor of pulverizer. Product is pulverized by impact and attrition between moving and stationary pegs

inserts of tungsten carbide. Here are steps in typical application:

Operations. (1) Machine surface of base metal to be hard faced. (2) Degrease with trichlorethylene, clean with carbon tetrachloride. (3) Grit blast tungsten-carbide inserts with silicon-carbide grit to remove surface oxides and other films.

(4) Flux machined surface of base metal with brush. (5) Cut strip silver (silver solder) to size and dip in flux. Then put in position on base metal. (6) Dip a copper screen or copper sheet in flux and place on strip silver. Because insert's coefficent of expansion is not the same as the base metal's, always put copper between. This also takes impact shock, as inserts are hard, with no give. (7) Flux second strip of silver alloy and place on copper. (8) Fut inserts in position on top layer of strip silver. (9) Braze by directing flame under base metal until both strips of silver melt. (10) Test bond by tapping inserts with a hammer. Tone indicates the quality of the bond.

Tungsten carbide can also be used to tip your maintenance tools. Technique is same.



POWER-OPERATED POSITIONER holds round parts in chuck, rotates at steady speed so operator has hands free to do smoother job. Pedal controls speed

HANDY POINTERS TO MAKE YOUR HARD FACING BETTER

Preheating metal before hard facing distributes and equalizes stresses set up by pull exerted from cooling deposit. Preheat temperature depends on type of base metal and facing alloy.

Heat by playing flame over metal. Or place part in an oven. Some jobs can be induction heated. When hard facing small pieces with a torch, flame ahead of molten metal often does enough preheating.

How Much Preheat? The more preheating the less warpage. If a long, flat piece of sheet iron is heated to same temperature as alloy deposited, both metals naturally contract together on cooling. Then the only chance of warping can occur if the rates of expansion are different. But usually it's only practicable to preheat a few hundred degrees.

Cooling hard-facing deposit does not have a firm hold on the base metal, however, because part of pull is taken up by plastic movement in molten deposit. And the hotter you keep the job while hard facing, the easier it is for plastic movement. Caution: If base metal is kept hot enough to be near plastic state, facing deposit will tend to compress the base metal.

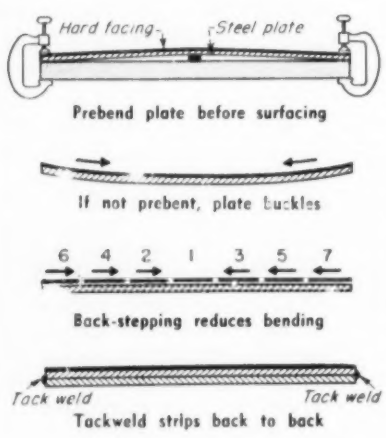
No Preheating. When hard-facing thin metal, prebend as shown in sketch. Bend plate over thin center piece and clamp ends to heavy piece of metal. Unclamp when you finish hard facing so cooling alloy pulls plate straight. Experience shows how much to prebend.

Relieve stresses set up during hard facing by tempering or annealing deposit from 1000 to 1200 F, depending on the metal. For complete stress relieving, entire piece must be heated and cooled slowly.

Cooling. One method of slow cooling is to drop small parts into a container of powdered insulation, allow to stand for about two days. Keep hard-faced parts away from moving air and cold metal while cooling. Place on fire brick and cover with insulation if pieces are large. Or drop in lime, dry sand, mica. Even sawdust does a good job—it burns slowly.

Theory of slow, even cooling is to keep one part of piece from cooling and contracting fast, pulling on slower cooling parts. That may cause cracks or serious distortion of part.

Special Equipment. Turning device speeds work, gives smoother deposit. A contact pyrometer is handy to register exact temperature for preheating or annealing. Portable, it can be carried to any job. Large dial shows temperature when instrument touches metal to be tested.



AVOID BUCKLING

If not preheated or prebent, thin work will buckle. One way to avoid this is to back-step, as shown. Deposit short strip in center; add beads at alternate sides, working toward center. Another way is to tackweld. With backstepping, warpage can be minimized. Partly submerge small parts in water to carry away excess heat

ROUND TABLE

When is a Toolmaker?

"Looks like you've really stuck your neck out this time, Al, and the boys in the toolroom are pretty sore about it."

"Sore about what, Ed?"

"You know what I mean. You've had Judson transferred to the toolroom and given toolmaker's rate."

"Well, he rates it, doesn't he? He's the best all around machinist I've ever had, and there isn't a job on the machine or on the bench that he can't do. I'll match him against any of the toolroom boys any time."

"That's not the point, Al. He's never served an apprenticeship in toolmaking, and no matter how good he is he can't ever qualify as a toolmaker."

"Now, look: Maybe when he was a kid he didn't officially serve an apprenticeship, but he's been well taught, just the same. And he's had a lifetime of experience, and that's a whole lot better than a lot of those young squirts in the toolroom can say."

"Don't try to beg the question. In my book a toolmaker doesn't rate unless he has served a full apprenticeship. I'll admit he is a first-rate man, but he has to stay in his own field."

"Oh, bushwa. I suppose you'll say the company president isn't entitled to his job because he didn't start out as an office boy, but as a greasy-handed machinist."

"That has nothing to do with the case."

"Yes, it has, Ed. I hated to let Judson go, and I would have liked to be selfish and keep him on my crew, but he wanted more money, and was worth it. He was getting top rate, so I couldn't pay him more, so I did the next best thing and had him promoted to toolmaker. Now he is a real asset to the company, but if he hadn't gotten the move he would probably have quit."

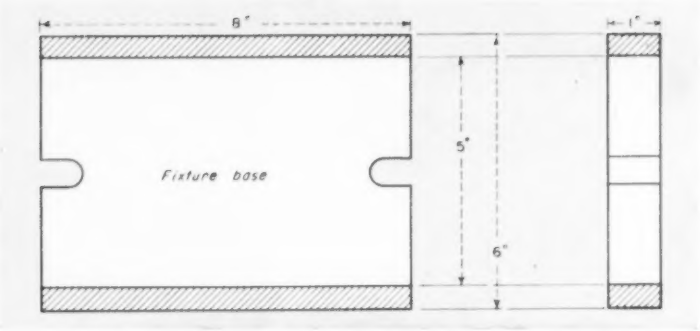
"I suppose you have the idea that he'll become president some day, and then he'll promote you."

"You know me better than that, Ed. I did it for his own and the company's good. And what are you griping about? It's no skin off your nose."

"No, but it will be skin off my nose, and yours, too, if the toolmakers go on strike, and then what are you going to do?"

***CAN MACHINISTS** be fairly promoted to toolmakers, provided they have the ability to do the work? Or must they have served a formal apprenticeship? If this is not done, where are we to get toolmakers when there are so few apprentice training programs? Your ideas and opinions on this subject will help others. Discussions on earlier subjects appear on later pages.*

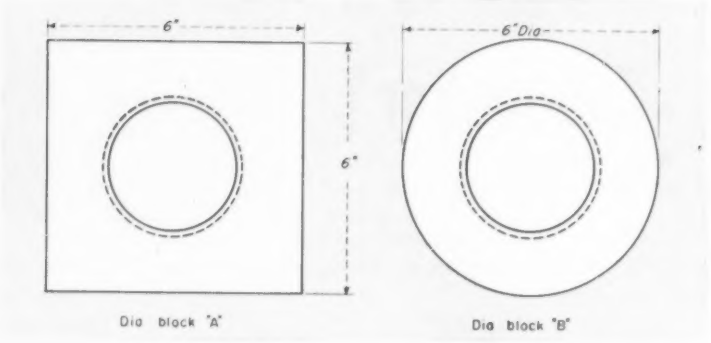
Cut costs of tool design-and-make



SHADED AREA represents wasted machining

Three steps are proposed to cut the cost of all your tool design and toolmaking by simplifying procedures, and returning to a more traditional idea of toolmaking

BY ROBERT A PETERSEN
Chief Tool Engineer,
SIGNODE STEEL STRAPPING CO, Chicago, Ill



GRINDING one surface may be enough

Thirty years ago, a toolmaker built tools direct from part prints, using his imagination and experience to decide what sort of tool was needed. Today, for reasons we all know, he works from tool drawings, but something has happened. During the last decade, because of an acute shortage of skilled labor, we have raised a generation of toolmakers who are so dependent on tool drawings that the majority of them can't do any thinking on their own.

Out of this situation has grown the expensive habit of making everything according to print, whether it makes any sense or not. I found the causes to be a lack of understanding or false interpretation of drawings and a disregard of cost.

To try to cut this waste, I'd like to propose three rules:

1. Draw only what needs to be drawn.

2. Machine only when and where needed.

3. Check only dimensions important to the proper functioning of the tool.

If these rules are followed, it will save millions of dollars which are being wasted in American production every year in the design and making of tools.

MACHINE ONLY SURFACES THAT MATTER

Suppose the toolmaker had the drawing of a fixture base shown above. The part calls for a piece of cold-rolled steel, 1 x 5 x 8 in. This size was chosen because it will do the job, and it is also a popular stock size. Now if the nearest size in the crib was 1 x 6 x 8 in., the next thing the toolmaker would do would be to take the oversized stock to the shaper and make chips out of the extra inch of material. Why? It doesn't make the part work any better, but the drawing called for 5 in., not 6 in., so the man uses up valuable machine time to make a meaningless dimension. There are other reasons: fear of having the part rejected; fear of loss of prestige as a skilled mechanic; and, most important, the habit formed over many years of doing everything the way the man on the bench does it.

DRAW ONLY WHAT NEEDS TO BE DRAWN

Each designer has a style of his own. This applies to the way he draws, and what he puts on the drawing. Most of the time this is all right, but many designers make simple drawings too detailed, and complicated drawings too sparse. There must be a compromise, where enough information is put on the drawing to make a tool that does the job, but not so much detail that the toolmaker can't use any discretion.

Let's look at another example: The die block above might be from 6-in. square, or 6-in. round, stock, What is the first thing a toolmaker does when he starts the job? With the square piece, he goes to a surface grinder and squares it up. Not just one side for dimensional layout, but all six sides. If it had been round, he would have put it in a chuck and taken a cut on the diameter. Why? After it comes out of the hardening furnace, it doesn't look any better, but the jobs on the mechanic's bench look like "precision" work.

INSPECT ONLY DIMENSIONS THAT MATTER

There are a lot of dimensions from which any deviation is permissible, *as long as the tool does the job it is supposed to do.* To prevent the inspection department from rejecting good tools because a meaningless dimension was not held, it is best to do something about dimensions.

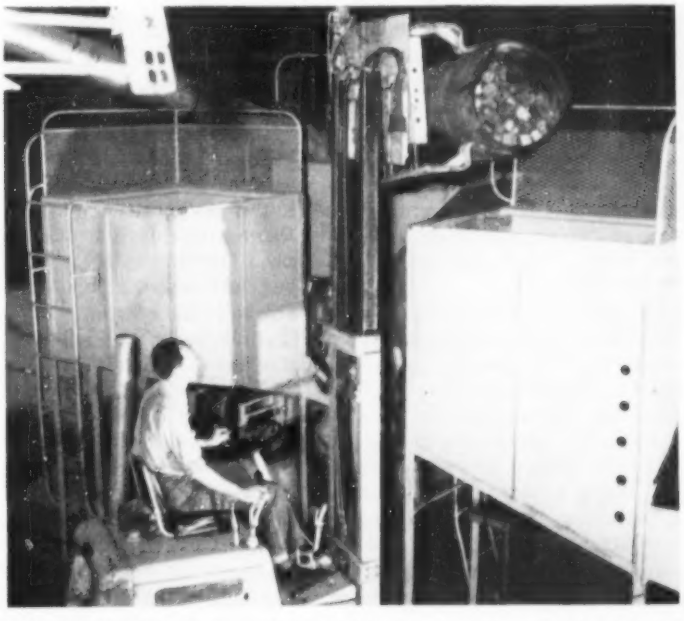
An understanding must be reached by everyone concerned about which dimensions are important enough to need checking, and which should be left alone. This is not hard to do. Fractional dimensions obviously needed only for constructing the tool, like the size of a base, the shape of a gusset, the length of a handle, or diameter of a knob, to mention only a few, should not even rate a second look by the inspector. Other fractional dimensions which are important, but not important enough to be checked with a micrometer or any other precision instrument, and which may have a tolerance of ± 1/64 in., should be checked with a toolmaker's scale. Dimensions shown in decimals should be checked according to their indicated tolerances, but even then it would be wise to underline dimensions which must be absolutely right. Certain decimal dimensions lose the need to be checked for accuracy, as they have served their purpose while the tool was being built, and are no longer to be considered important.

The point is, let's start a return to the "good old days" of toolmaking, where the toolmaker was a highly skilled technician, well-versed in the most difficult machining operations of a metalworking shop. It may be hard to start such a program, because of a shortage of really good craftsmen, and the habits of the past few years. But once we begin thinking in the terms discussed above, the battle is half won. Why not see if it'll work in your shop?

All that is needed to put this plan into action is a little cooperation between the toolroom, design department, and inspection, and considerable savings to everyone concerned will result.

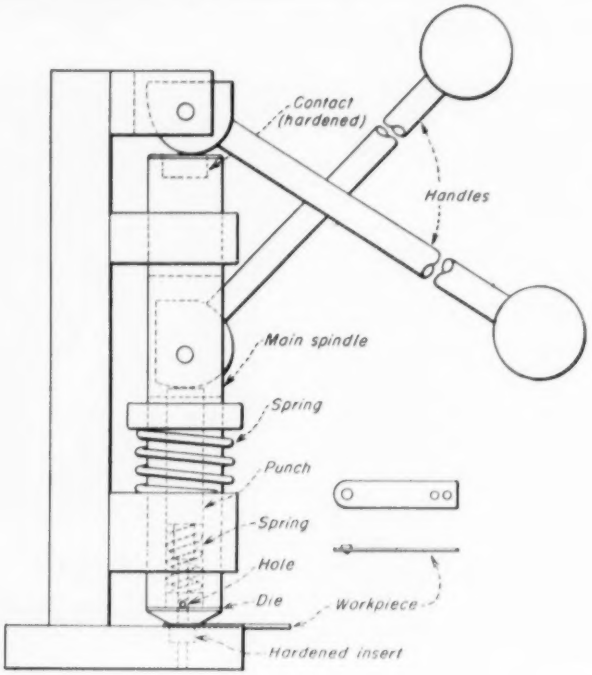
Tongs truck small parts by the barrel-full

BETWEEN OPERATIONS, in-process parts at the M B Austin Co are kept in temporary storage, 550 lb of parts per barrel. Before the hydraulically powered Clark Equipment clamp-and-swivel attachment was installed on lift trucks, operator balanced the barrel on one fork of a conventional lift truck while the other fork was shifted to allow dunnage to be placed under the barrel. Also, barrels were tiered only two high



CONVEYOR LINE IS FED from this 100-in.-high hopper. Old method involved man climbing 6 to 8 ft up a ladder and manually dumping barrel contents into the hopper. Manual dumping was especially dangerous when putting parts into washing or plating baths, because of the heat and steam rising from these baths

Practical Ideas



Hand-Operated Double-Action Press Sets Copper Contacts

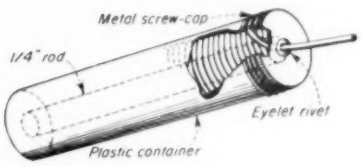
On a contract for several thousand electrical assemblies, each unit contained a steel leaf spring with a copper contact at one end. Instead of running special rivets on a screw machine and inserting and riveting them, we built the device shown. This tool cuts off a slug of copper, forms the contact, and heads it over in the leaf, all in one operation.

In essence, the tool consists of a base and a vertical member which carries the main spindle. The workpiece is placed in a nest in the base and the upper cam is rotated against the hardened contact to drive the spindle against the work. The end of a length of copper wire, of suitable diameter, is pushed through the hole in the side of the hardened die until the wire hits the opposite wall. Now the lower cam is rotated to drive the punch down. This punch shears off a slug of copper, extrudes it through the hole in the work, and forms a contact on the top and a round head on the bottom. The hardened insert contains the cavity which forms the head.

Upon completion of the contact, the two handles are lifted and the spindle and punch are returned to the "up" position by the springs. During the return stroke, the spindle is lifted slightly ahead of the punch, hence the punch strips the finished piece from the die. A slight burr on the wire, made by the punch during shearing, prevents the wire from falling out as the spindle is lifted.

As shown, two sliding members are cam-operated, with the cams rotated by handles set at a slight angle for clearance. This is satisfactory for light work, but for heavier work the upper cam should be omitted and the entire unit placed in an arbor press. Thus, the press ram would drive the spindle. It is also possible to use compressed air to operate this tool with a punch press. For the latter method, a heavy spring would provide the clamping pressure on the spindle.

For our purposes, the rivet served as a contact point. The same method can be used to join two steel strips. *Henry Gifford, Bronx, NY*



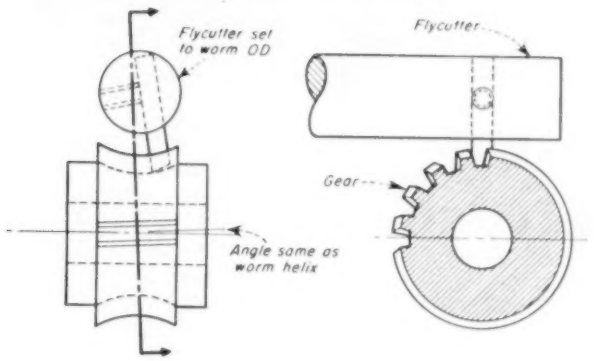
Container for Wire Solder Works as Handle and Feed

Drill a hole in the center of the cap of a cylindrical plastic container (size: About: ¾ in. x 3 in. long) and fasten an eyelet rivet in the hole. The cap should be of the metal screw-on design. Wind the soldering wire helically around a ¼ in. rod until it is a few layers deep and will slip into the container. Then pass the inside end of the wire through the eyelet and screw on the cap. Thus, the container can be held in the hand while soldering and the wire is simply pulled out as it is used. *Haim Murro, Boston, Mass*

Hold-Down Attachment for Metal Bandsaw

A simple hold-down attachment, consisting of a bracket clamped to the blade housing which carries a rod at its outer end that, in turn, is attached to a clevis and roll, will apply pressure to the work and free the operator's hands. The rod is loose in the bracket and a compression spring surrounding the rod maintains pressure on the work through the roll.

This attachment automatically adapts itself to the thickness of the work. When sawing circles, the spring pressure holds the roller at any angle at which it is placed, but permits a slight amount of castoring. By freeing the operator's hands, safety is improved and work more accurate. *R H Crum, Frederick, Maryland*



Emergency Setup Simplifies Cutting Worm Gear in Shop

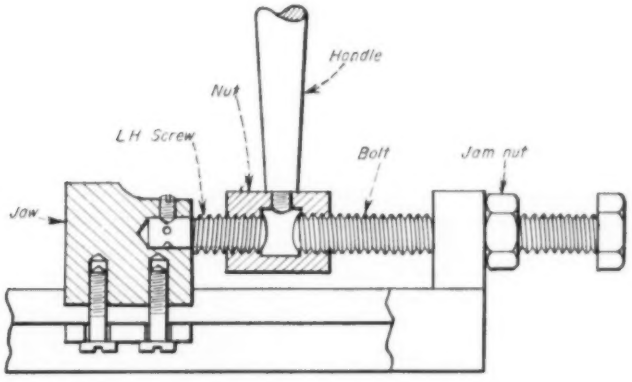
When trouble developed in the crossfed mechanism of a lathe, it was traced to a bronze gear which engaged a steel worm in the apron. As the gear had lost a few teeth and a replacement would take weeks to obtain, we decided to make one in our own shop.

Only a plain miller and some engine lathes were available, so we had to work out a special setup. A bronze blank was made, to the dimensions taken from the broken gear, and mounted on a mandrel fastened into a dividing head which was set up on the miller. The dividing head was positioned at an angle equal to the helix angle of the worm, and the sector plate was adjusted to space out the required number of teeth.

A toolbit was ground for the flycutter arbor of the miller and set at a radius to revolve through the same diameter as the worm OD. As the worm form angle was 29°, the flycutter tool was ground to 20° and slightly thinner than the tooth space required. Next, the blank slots were cut by feeding down until the distance between the miller arbor and the dividing-head mandrel was the same as the distance between the shafts carrying the worm and gear as they were assembled on the lathe. This operation was repeated for each tooth until the gear blank had a complete set of slots around its outside diameter.

Then a hob was made to the same size as the worm—from cold-rolled steel bored to suit the miller arbor—and gashed with a ¼-in. cutter to leave about ⅝ in. of land between the gashes. The hob was cyanide-hardened (about 15 min. in the bath) and then water-quenched.

The dividing head was set at 90° to the arbor, parallel to the table travel, and the driving dog was removed from the mandrel, which was allowed to spin freely on the centers. Mounted on the arbor, the hob was located over the center of the blank. As the hob was rotated and rapidly fed into the blank to full depth, the blank was caused to rotate with the hob helix and a perfect gear was generated. After completing one gear, the hob showed no wear. *Douglas Bennie, Port Coquitlan, Canada*



Altered Small Vise Does Quick Clamping

Here's a way to adapt a standard small machine or table vise for quick clamping on short runs where extensive fixturing isn't practical.

First, the vise screw that acts on the movable jaw is removed, and an assembly is put in its place. This consists of a standard right-hand screw or bolt that fits the vise, a double nut and handle, and a coarse left-hand screw. One change to the jaw is the addition of a pointed screw in place of the regular small clamping screw (if any). This fits into one of four V-holes drilled around the end of the left-hand screw.

The nut is a piece of round or hex stock bored through, relieved in the middle for a reasonable distance to clear the ends of the screws, and tapped left- and right-hand to fit the screws. The handle is pressed into the nut.

When assembled, the unit is adjusted for jaw spacing with a jam nut outside the regular vise lug. The handle is worked through about 180° of rotation to close or open the jaws. This motion should be enough to grip or release parts of the same rough dimension for various machining jobs. Adjustments for jaw spacing—as on different parts—are made by resetting the jam nut and moving the longer screw. *B Erteschik, Birmingham, England.*

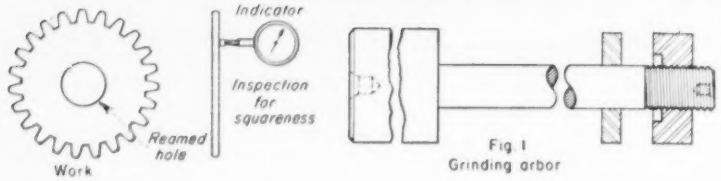


Fig 1
Grinding arbor

Precision Gears Handled As Unit

The chief difficulty of making thin gears out of sheet stock is their tendency to wobble unless the squareness of both faces is insured. This is most difficult when the gears are fashioned singly. We developed a way of reaming, cutting, and grinding a quantity at once. Hence, by turning them out as a unit, uniformity was maintained and accuracy achieved.

We punched the blanks from stock which was oversize as to OD and thickness, normalized, and cold-rolled. We ground both sides of these blanks on a surface grinder to the desired thickness using the proper coolant, a soft wheel, and the right depth of cut to prevent warping. We then loaded the blanks into the fixture shown, which was a simple cylinder fitted with a tightening nut and center extension for chucking. This fixture was mounted and trued to a lathe axis and the center hole of the assembled blanks was bored and reamed. The blanks were next mounted on a special arbor, Fig. 2, the face and clamping collars of which were ground square. This arbor was used to grind the OD.

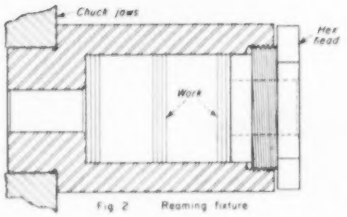


Fig 2 Reaming fixture

The teeth were also hobbed on this arbor and deburred. Finally each individual gear was inspected with a dial indicator. *C Y Lee, Tai-Chung, Taiwan, China*

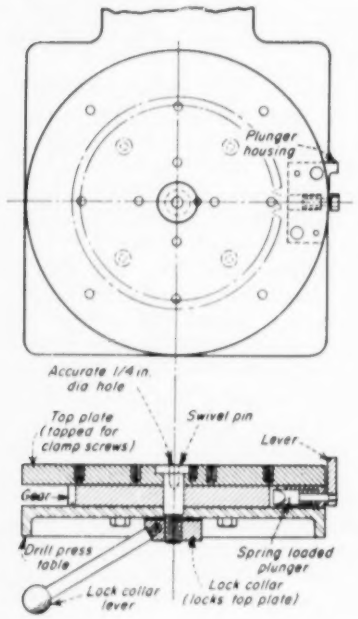
Connecting Electrical Units Makes Useful Adapters

Upon moving our shop to a new location, we found it equipped with single phase electrical receptacles, some taking two- and some three-pronged plugs. When it came time to hook up our tools it was difficult to find receptacles to fit their plugs.

The problem was solved by making several units consisting of three-prong plugs wired to bulb sockets into which were screwed two-prong plugs, and other units of two-pronged plugs wired to sockets into which were screwed three-prong plugs. *Fred Lettino, Astoria, L I, N Y*

Homemade Indexing Table Utilizes 60-Tooth Gear

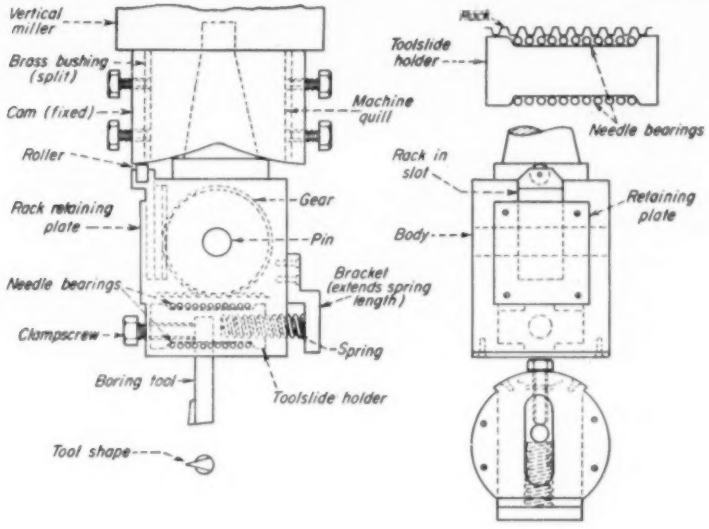
To space quickly and accurately drilled holes around the circumference of a circle, I built the indexing table shown. The main component is a 60-tooth gear picked up in a junkyard. By using this gear, it is possible to equally space 2, 3, 4, 5, 6, 10, 12, 15, 20, and 30 holes.



The gear is bolted to the drillpress table so its bore is exactly aligned with the center hole in the table. A swivel top plate is made, complete with tapped holes for clampscrews used to retain the work and for a lever-operated spring-loaded plunger. This plate, too, is bored to align with the gear bore; and a swivel pin and lock collar are made to pass through these bores, align the components, and clamp them for drilling. The spring-loaded plunger is used to determine the desired gear-tooth spacings. A ¼-in. hole is drilled in the center of the swivel pin to aid in centering the drillpress spindle over the index plate by using a piece of ¼-in. drill rod in the drill chuck. Also, by placing one piece of drill rod in the swivel pin and a second piece in the drill chuck, radii can be accurately set with a vernier caliper. *Harold Graham, Stockport, England*

Splayed Chisel Cuts Sheet Steel Like Butter

To cut an opening in a tank or in sheetmetal, a splayed or can-opener design of chisel is extremely effective. The cutting point of the chisel's center tongue is sharp, but the other jaws are rounded. An offset of about 35° is provided between the base of the chisel and the shank. The chisel is sharpened by grinding the top surface of the center tongue. A slight hollow grind will improve cutting. *C H Willey, Concord, NH*



Bore Rectangular Holes With This Milling Attachment

To bore square, rectangular, oval, and other odd-shape holes, I developed the device shown. Originally it was used to produce rectangular holes in plastic panels, but it will work well with any material. While most attachments will cut only equi-sided holes, this tool is not so confined. However, the corners will have a slight radius rather than come to a sharp angle.

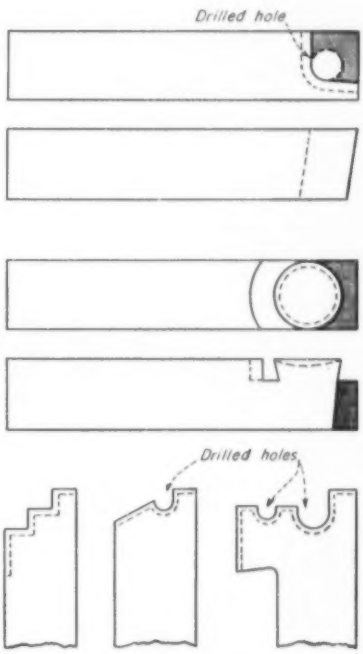
The body of the attachment is machined from a steel bar and it is tapered to fit the quill spindle of a vertical milling machine. First, a cam is turned and bored to fit the quill. To protect the quill, a brass bushing is split and pressed into the cam bore. Then the cam track is milled and filed to the final shape desired in the work. The attachment's shank is tapped to suit a standard draw bolt. Cam material is tool steel, hardened after cutting.

A deep slot is milled in the tool body to accommodate a gear that revolves on a pin, which is pressed into a hole bored into the body at 90° to the gear slot. A wider slot, or counter-slot, is cut at the outer edge of the gear slot to take a vertical rack. This is selected to suit the pitch of the gear. To allow this rack to move up and down, but not drop out of the slot, a rack-retaining plate is fitted to the body and turned to the same diameter as the body. A roller cam follower is fastened at the upper end of the rack.

In the bottom portion of the body is mounted a horizontal sliding toolholder supported on needle bearings to minimize friction. The end of the toolholder is bored to suit a compression spring, which is prevented from falling out by a bracket fastened to the OD of the body. On its underside, the toolholder is bored to suit the boring-tool shank.

A second rack, similar to the vertical rack, is fastened to the horizontal toolholder. This rack also engages the gear in the slot.

In operation, the milling-machine quill is lowered until pressure is felt on the compression spring, and the table is raised until the tool is almost touching the work. Then a trial run at slow speed is made to indicate the path of the tool. The quill is raised or lowered for final adjustment, and the cam is fastened with clampscrews to prevent it from turning. As the cam is stationary and the main body revolves with the machine spindle, the roller follower on the vertical rack acts on the cam face. Thus, the vertical motion of the vertical rack, caused by the roller on the cam, is converted through the gear to horizontal movement of the horizontal rack and the toolholder. As the spindle rotates, the cam causes the boring tool (wedge ground) to move in and out as necessary. High speeds and light cuts are best, and the cutting action is very smooth. *Allan Clarke, Rochdale, England*

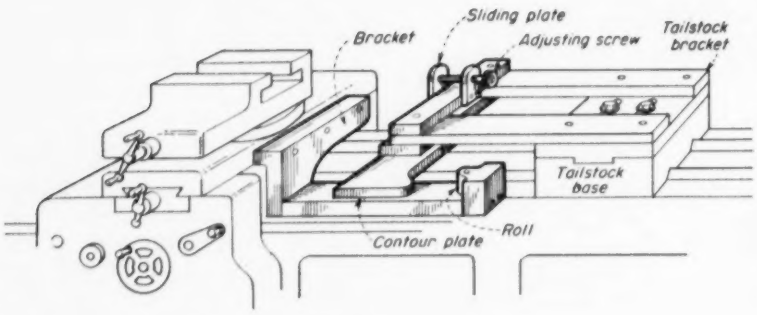


Inexpensive Form Tools

To make toolbits to cut convex shapes, the desired diameter hole may be drilled in flat ground stock of a size capable of fitting the toolholder to be used, and a tapered reamer inserted from the bottom side of the hole to about 1/64 in. of the top edge. This will give enough rake on the radius and the extra stock is easily machined off.

For those designed to cut concave radii, the stock is held in a four-jaw-chuck and the desired diameter turned. The front, side, and top rake angles are all turned with one setup and surplus stock is removed.

Ottavio Cerullo, East Boston, Mass



Tailstock Mounted Contour Fixture Saves Space on Lathe

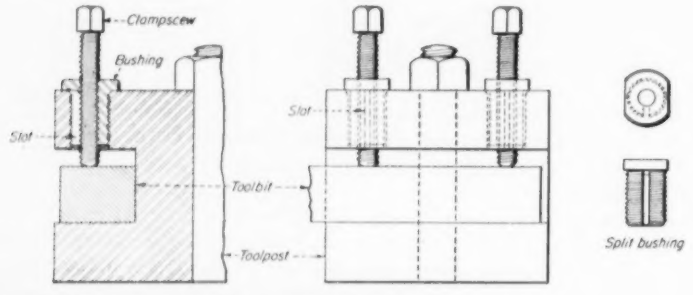
Sometimes lathes are so positioned that the width of attachments is important. We saved space by mounting a contour unit on the upper part of the tailstock.

The unit was so satisfactory that some details of its construction may prove of interest.

The contour plate was finished as desired and bolted to the slide plate which was keyed to the tailstock bracket so that fine adjustments necessary for finish cuts could be made. Larger adjustments are made by sliding the entire tail assembly on the lathe ways; the contour plate being adjusted either in or out by moving the bracket. Finer adjustments of the cut are made with the lathe compound.

A roll bracket is attached to the lathe cross-slide. In operation, the roll which is of the same radius as the cutting tool, is brought into, and kept in contact with, the contour plate by a steady hand pressure on the carriage wheel. Certain contours make it possible to use either the cross or the longitudinal feed, these are both hand operated.

It is important to note that spaces must allow ample room for carriage travel and that the carriage is backed away from the work for measuring purposes. *L R Elliott, Oakland, Calif*



Modified Toolpost Aids Clampscrew Extraction

Much time and temper is consumed in extracting bent or mushroom-ended screws from lathe toolposts. Here is a better method.

A toolpost is bored and threaded to receive bushings, threaded inside and outside, which have been partially slotted and milled with two flats for wrench use. Into these the clampscrews are inserted.

When it becomes necessary to remove a distorted screw, it and the bushing are extracted as a unit. The milled slot is for spreading or prying if needed. *W M Halliday, Southport, Lancs, England*

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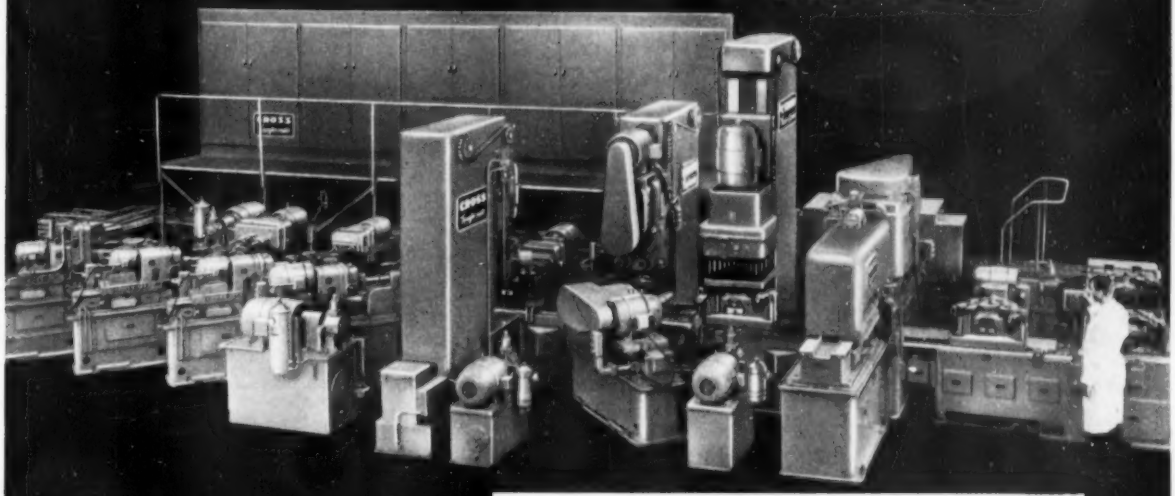

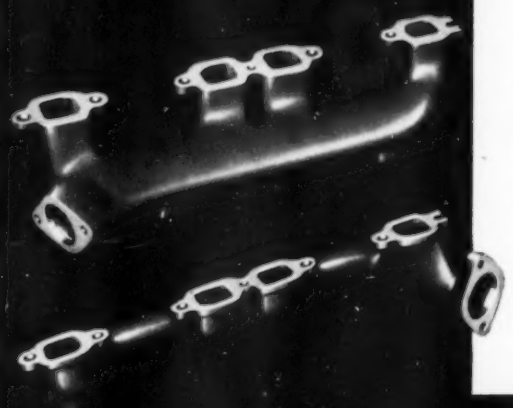

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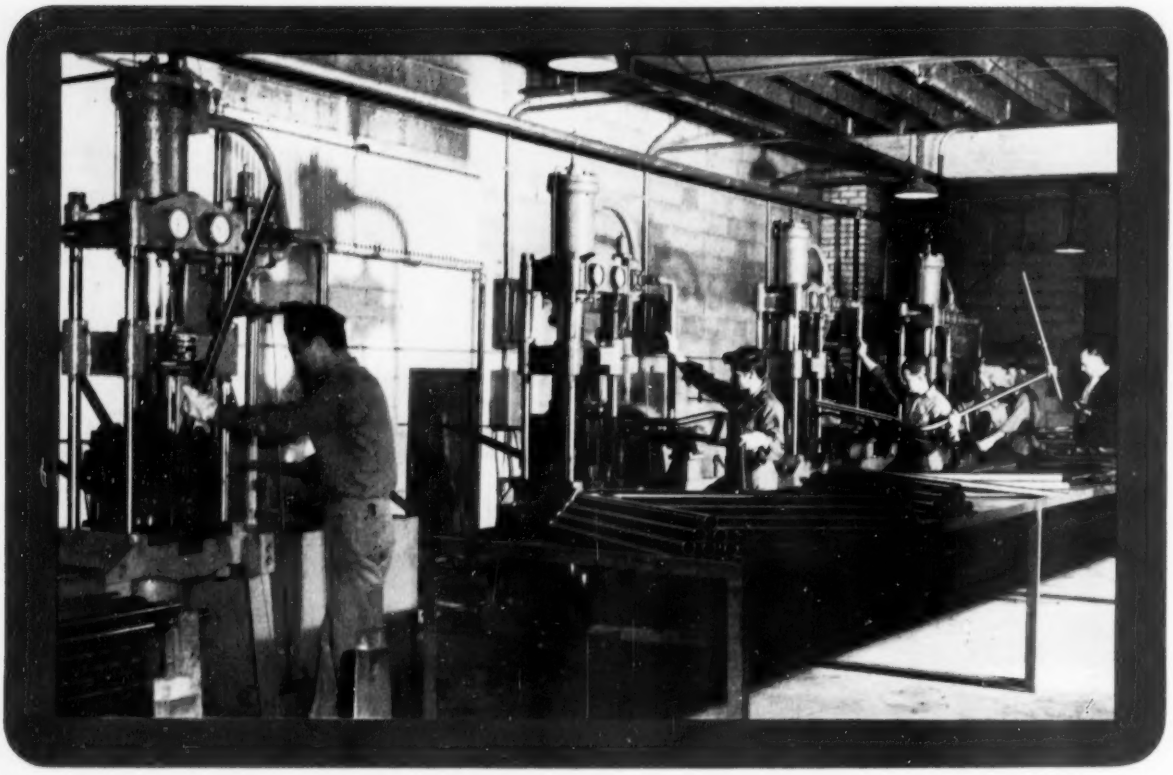

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Clamping Devices for Cylindrical Members...I

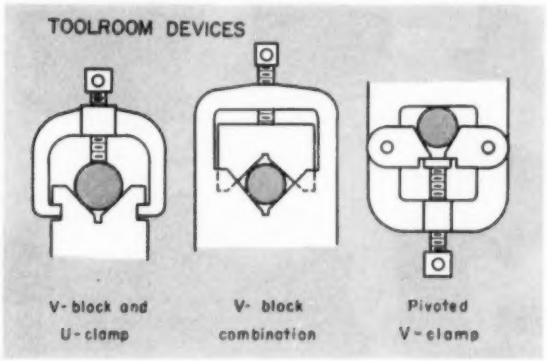
By HAIM MURRO

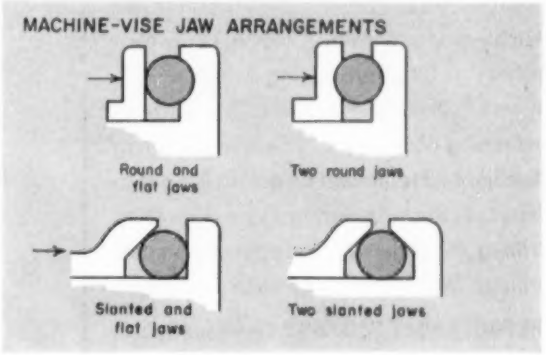
The round cross-section of a cylindrical member requires only three holding points distributed over more than half the cross-section to insure positive clamping.

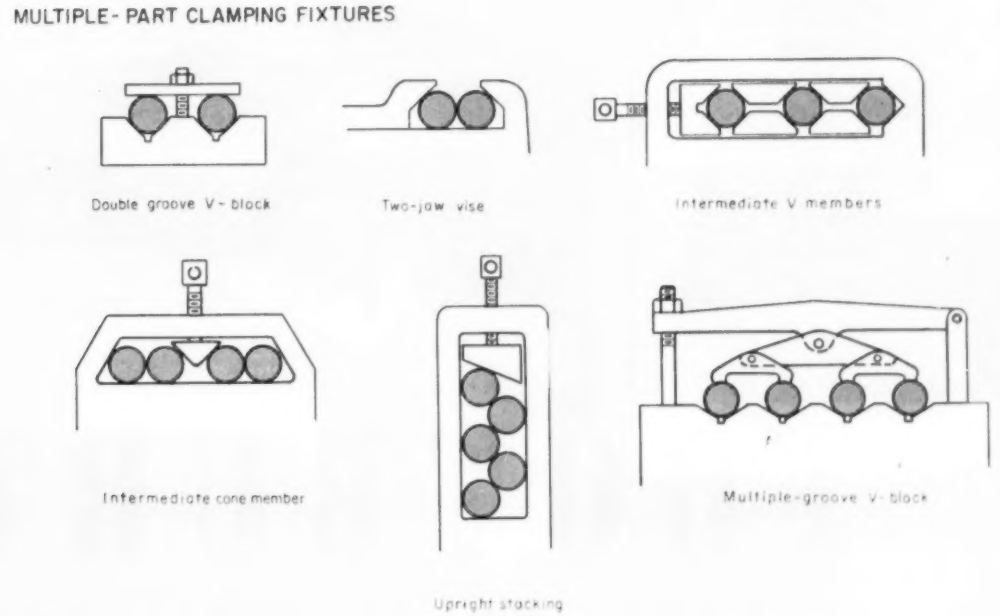
Devices used for temporary clamping of the cylinder, like jigs and fixtures, have the objective of positively locking the cylinder, combined with ease of clamping and unclamping. These devices usually employ three contact lines.

Devices used for more permanent clamping usually grip the cylinder at more than three contact lines.

All devices, though made for a certain size or sizes of work, feature a certain amount of adjustment to conform with the actual size of the cylinder clamped.







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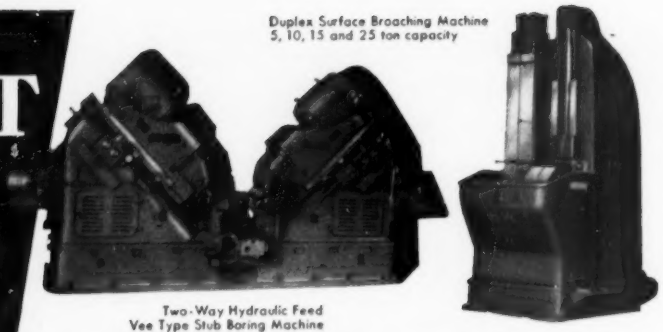

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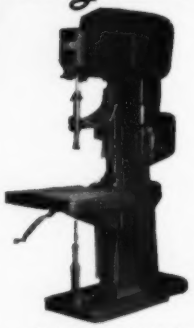

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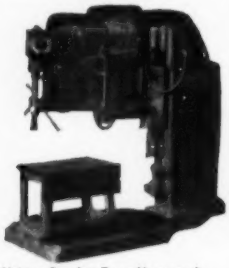

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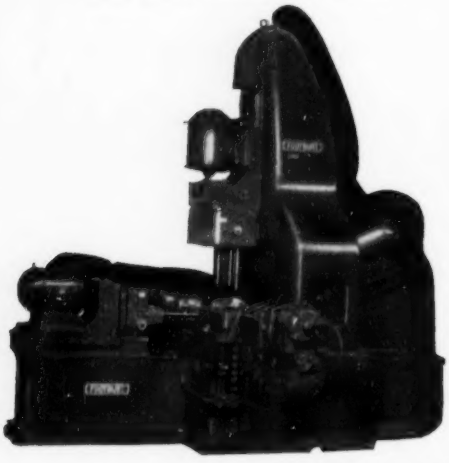

Five Way 21 Spindle Lead
Screw Tapping Machine

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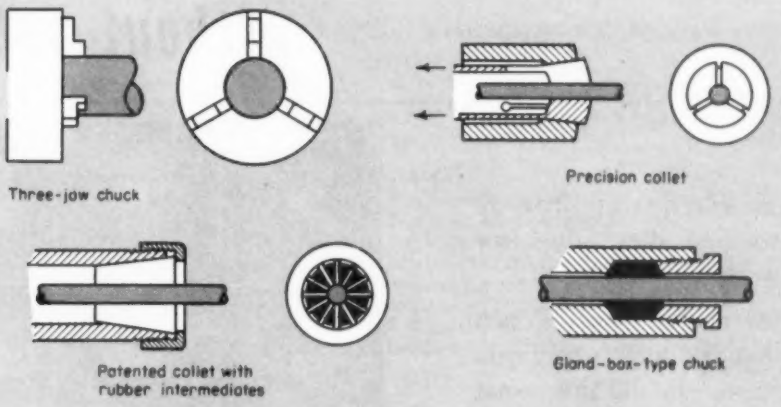
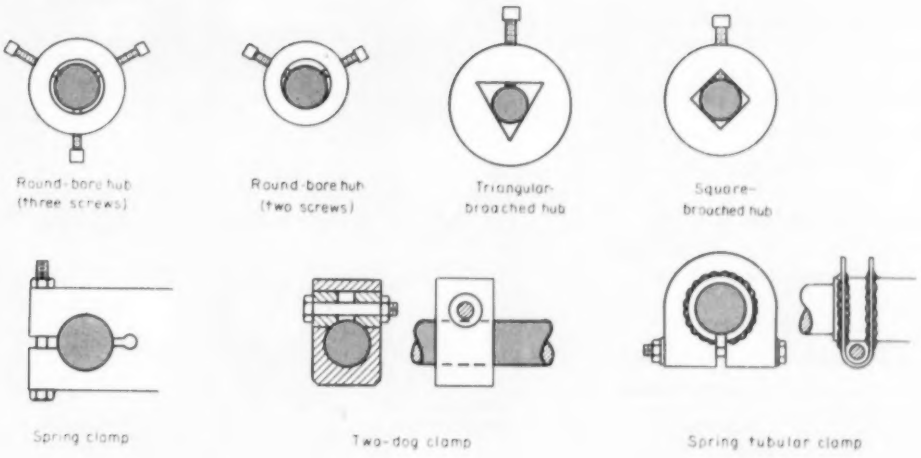
PRODUCTION MACHINE TOOLS

Clamping Devices for Cylindrical Members...II

CHUCKS



MACHINE MEMBERS



PLANT EQUIPMENT

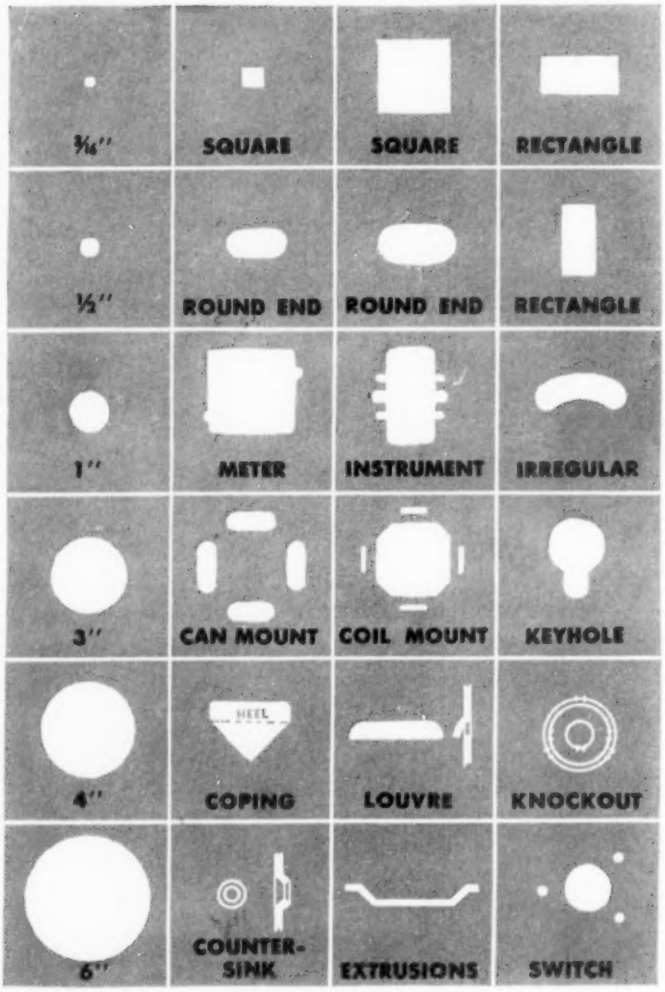
look . . .

any one of these 24 punches and dies

READY FOR USE IN 5 SECONDS

without set-up!

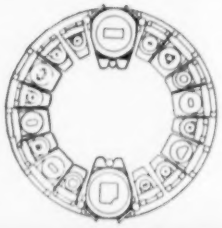
- Or, any selection of 12 to 32 punches and dies suited for your work.
- A Wiedemann Turret Punch Press has the tools where you want them—in the press—not on the shelf.
- In 5 seconds the operator selects the punch and die, and pierces the opening in flat sheet metal or plate.
- Any punch and die in the turret can be replaced with other sizes in less than 2 minutes.



WITH A WIEDEMANN YOU CAN SAVE 60% TO 90% ON SMALL LOT PIERCING because you

Eliminate Set-up
Eliminate Layout with Wiedemann Work Locating Gauges
Reduce Handling Time

We will make time studies on your work without obligation. Send prints.



Plan view of lower turret of typical Wiedemann with 18 stations.

WIEDEMANN MACHINE COMPANY

4272 Wissahickon Ave., Philadelphia 32, Pa.

American Machinist REFERENCE BOOK SHEET

Check Sheet for Grinding Troubles

BY KENT MATHIAS, Manager, Grinding Machine Sales, CINCINNATI MILLING AND GRINDING MACHINES, INC

POOR FINISH

CENTERTYPE

1. Dull or cracked diamond
2. Loose diamond or diamond holder
3. Diamond overhangs too far
4. Poor grade of diamond
5. Wheel out of balance or roundness
6. Oil on portions of wheel
7. Dull grinding wheel
8. Incorrect wheel grade
9. Sharp corners on wheel
10. Improper speeds and feeds
11. Excessive stock removal
12. Headstock belts slipping
13. Unmatched belts on wheelhead
14. Dirty, incorrect or insufficient coolant
15. Insufficient coolant when dressing
16. Dirty workpieces
17. Centers too long or loose
18. Loose wheel or wheel mount
19. Loose sheave on grinding-wheel spindle
20. Vibration from outside source

CENTERLESS

1. Incorrect wheel grade
2. Dirty, incorrect or insufficient coolant
3. Wheel-dressing rate too fast
4. Pick-up on workrest blade
5. Loose workrest blade
6. Blade angle too steep
7. Blade not rigid enough to support work
8. Wheel out-of-balance
9. Oil on face of wheel
10. Loose regulating wheel
11. Loose, cracked or dull diamond
12. Poor grade of diamond
13. Dirty workpieces
14. Work too high above center

OUT OF ROUNDNESS

CENTERTYPE

1. Loose or incorrect taper on centers
2. Workpiece not properly supported
3. Too much footstock tension on slender work
4. Not enough tension on footstock
5. Headstock or footstock not clamped properly
6. Condition of workpiece center holes
7. Lack of lubrication on centers
8. Overheating due to lack of coolant
9. Stock removal too rapid
10. Insufficient dwell
11. Out-of-balance workpiece

CENTERLESS

1. Work not high enough above center
2. Workrest blade angle too small
3. Workpiece bowed
4. Interrupted cut due to keyways, holes, flats, etc
5. Regulating wheel loose on mount
6. Regulating wheel not dressed round
7. Workpiece out-of-balance
8. Rough end of piece—(infeed method)

TAPER

CENTERTYPE

1. Loose or incorrect taper on centers
2. Loose footstock spindle
3. Footstock or headstock not clamped tightly
4. Machine out-of-level
5. Condition of center holes in workpiece
6. Too much or too little dwell at one end
7. Over-travel of wheel at end of work
8. Dirt under swivel table
9. Insufficient coolant when dressing wheel

CENTERLESS

1. Guides not set properly (thrufeed)
2. Grinding wheel trued at taper (infeed)
3. Regulating wheel trued at different angle than feed angle (thrufeed)
4. Swivel slide needs adjustment (infeed)
5. Dirt under workrest or blade
6. Failure to keep workpieces butted end to end on thrufeed
7. Loose gibs

SIZING TROUBLES

CENTERTYPE

1. Loose or incorrect taper on centers
2. Insufficient dwell
3. Insufficient coolant when grinding
4. Improper wheel
5. Bad centers in workpiece
6. Incorrect lubricant or hydraulic oil
7. Inconsistent operating cycle

CENTERLESS

1. Infeed lever not moved at uniform rate from piece to piece
2. Parts overheating under cut due to improper wheel or coolant
3. Cam profile wrong
4. Cam follower not riding on cam properly
5. Deflection in cam follower not the same on all steps (infeed method)

Hardened Stainless Steel Piston Rings FLEX Without Breaking

Armco Stainless Steel piston rings are made for the tough jobs. These include high temperature applications such as seal rings for jet engines and steam turbines, and for actuating cylinders of aluminum die casting machines. Because of their corrosion resistance the rings are found in valves and pumps used by the chemical processing industry.

STRONG BECAUSE ROLLED

These stainless steel rings are made of rolled bar stock, stress-relieved after hardening to Rockwell C-48. They have a high degree of accuracy. As shown, the hardened rings can be twisted through 130° without fracture. Wrought condition of the metal eliminates the danger of breakage during installation.

STANDARD AND SPECIAL TYPES

Hardnesses up to Rockwell C-57 or better can be obtained with the standard hardenable chromium stainless steels, and Armco makes them all. In addition, there are the Armco Precipitation-Hardening Stainless Steels, 17-4 PH and 17-7 PH, hardened through low-temperature heat treatment.

PRECIPITATION-HARDENING TYPES

Armco 17-4 PH is a bar grade that develops high strength through a single, low-temperature heat treatment. Armco 17-7 PH is made in sheets, strip, plates, bars and wire. The grade is supplied in the annealed condition for severe drawing and forming. After fabrication, high strength and hardness are developed through a double low-temperature heat treatment.

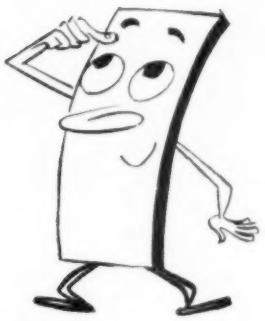
Write for the booklet, "Armco Stainless Steels," and for the bulletin on the Armco Precipitation-Hardening grades.

ARMCO STEEL CORPORATION

4113 CURTIS STREET, MIDDLETOWN, OHIO
EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

TALKING SHOP



Memory

CARTER HIGGINS, president of Worcester Pressed Steel Co, speaking at MIT recently, mentioned the "memory" of steel. His example was a box drawn from a disk, and he showed the tendency of the sides to return to their original circular shape. The remedy is a coining operation or very close tolerances in dies. The latter is difficult because of stock tolerances, the former costly.

A parallel phenomenon occurs in some plastics, which given a chance, will tend toward an earlier shape. Reminds us of a short thriller of some years back, in which the killer used a plastic dagger. He hid the weapon of his crime by dropping it into a pot of hot tea; there it resumed its previous incarnation as an inoffensive strainer. It's just as well the plastic hasn't quite that good a memory—or it might jump a couple of incarnations and embarrass everybody.

Clearance Angles

KEN BLAKE, vice-president of Metalloid, has suggested on several occasions that the metal immediately in front of a cutting tool is compressed by the radial thrust of the tool, then expands as the tool tip passes to rub against the flank immediately below the cutting edge. Mr Blake claims this causes flank wear.

Several major plants have made tests with carbide-tipped tools to test this suggestion, increasing flank clearance angle from the conventional 7° to 18 to 20°. In each case, tool life increased measurably, sometimes to 3 or 4 times that previously attained. Further tests indicated that 12° worked as well, so now all tools except some form tools with shapes where close edge support is essential are ground with 12° clearances. Herman Goldberg at Snow Mfg Co, Chicago, is grinding most single-point turning tools with 12 to 20° flank clearance.

Life Times Seven

SOUNDSCRIBER CORPORATION, New Haven, Conn, has a soldering fixture for magnetic-recording heads. Locating surfaces must be accurate within 0.0005 in., hence they lasted for only about 700 assemblies before corrosion by the flux forced replacement. Facing the locating inserts with Hastelloy B, a hard alloy not susceptible to corrosion from hydrochloric acid and to which solder does not adhere readily, proved to be an answer. Life on the first faces is already over 5000 assemblies.

Fathers

A FATHER is a fellow who growls when he feels good, and laughs loud when scared half to death.

A father never feels worthy of the worship in a child's eyes.

He's never quite the hero his daughter thinks, never quite the man his son believed him to be, and this worries him, sometimes.

So he works too hard to try and smooth the rough places in the road for those of his own who will follow him.

A father gets very angry when the first school grades aren't as good as he thinks they should be. He scolds his son, though he knows it's the teacher's fault.

Fathers give their daughters away to other men who aren't nearly good enough, so they can have grandchildren who are smarter than anybody's.

Fathers make bets with insurance companies about who'll live the longest. One day they lose, and the bet's paid off to the part of them they leave behind.

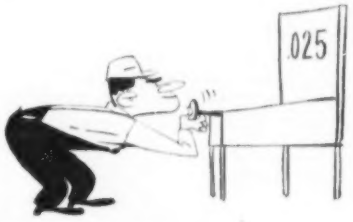
I don't know where father goes when he dies. But I've an idea, after a good rest, wherever it is, he won't just sit on a cloud and wait for the girl he's loved and the children she bore. He'll be busy there, too, repairing the stairs, oiling the gate, improving the streets, smoothing the way. —PAUL HARVEY.

Assist

THE MAKING of tiny precision ball bearings has received a great assist. Development of the ball-pen industry has created an annual demand for millions of steel balls of high precision. As a consequence, precise bearing balls of some sizes have not only become commonly available, but prices have been cut as much as 75%. Ball-pen sizes are now as little as $2 to $3 a thousand. Smallest commercially made bearing thus far is the 0.100-in.-OD size, with 0.025-in. ID and containing six 0.65-in.-dia balls. Don't try to assemble one if your hand trembles.

Not too much reduction in cost and size will make these tiny bearings a sound replacement for watch jewels, which cost only six or seven cents apiece, but are very fragile.

Such bearings are available in three materials, tool steel, stainless, and beryllium copper.



More on Bur "Grinding"

FURTHER OPERATIONS with carbide burs in "grinding" the bores of small hardened (R.63) inner races for tiny bearings (See *AM*, Mar 3, '52, p 142) at New Hampshire Ball Bearings, Inc, Peterborough, have developed several interesting facts. As yet, no grinding wheel has been evolved that will maintain tolerances or give equivalent production. Burs must be highly accurate, or the scrap percentage is too high. Production per bur varies from 200 to 5000 pieces, depending on quality of carbide and of grind. The original straight-flute design has been superseded by a helical-flute one. Smallest bores thus far burred in production are 0.055 in. in dia, done with an 0.045-in.-dia bur. However, 0.040-in. bores have been "ground" successfully. Rotative speeds for the bur vary from 27,000 to 125,000 rpm, but best speeds appear to be over 60,000.

Korean Truce Will Have Little or No Effect On Military Procurement, Pentagon Says

WASHINGTON—The Korean truce won't change military planning for continued expansion and contracting next year. The military still figures on spending about $43 billion in fiscal 1954.

That's the plan of Assistant Defense Secretary Wilfred J McNeil, the Pentagon's top money man. He figures that the military may be able to cut spending possibly by as much as $1 billion over the coming year, but the cut won't come out of procurement. The savings, if they're made, will be in operating costs.

Present Policy to Continue

Barring a complete armistice that would wind up with everybody going home, the Pentagon still figures on going ahead with present plans for procurement.

Right now, about $64 billion in military contracts is outstanding; not counting the $34.5 billion voted for military appropriations for fiscal 1954. Contract letting during July and August totalled $4-5 billion for hard goods alone. And this rate is likely to continue through 1953.

Military spending—for all items, hard goods, soft goods, operation costs—remained at about $3.9 billion for July. It will come down somewhat for the rest of the fiscal year.

Military experts, however, figure that there might be a gradual let-up on ammunition contracting 60 to 90 days hence. Reason: without constant expenditure of ammunition, the military is likely to wind up with a superabundance of ammunition.

Arms Buildup Unaffected

The arms buildup program has not been based on Korea, however, but, rather on what the joint chiefs figure is needed to maintain a constant state of readiness.

Backlog: $26 Billion

Currently, the Army, Navy and Air Force have a backlog of about $26 billion in previously-appropriated procurement funds for weapons and equipment. Nearly all of this has been obligated, but there is still close to $13 billion in procurement money yet to be translated into firm orders.

Procurement Outlook

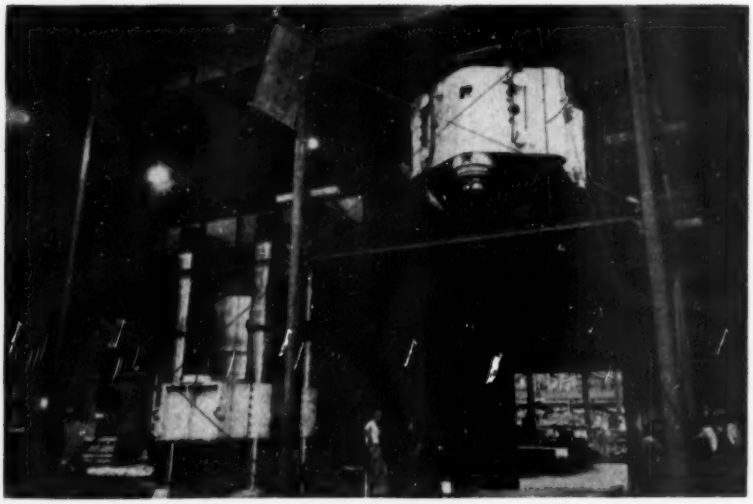
Here's a rundown on the major areas of procurement and what the Pentagon figures will happen over the coming year:

- **Aircraft:** no change in present procurement policies and programs that call for about 30,000 planes now on order or to be ordered over the next 2-3 years.
- **Shipbuilding:** no change in present plans for construction of about 18 new major ships, about 150 new service craft and conversion of 7 existing major craft.
- **Army materiel:** no change in the multi-billion-dollar Ordnance program is anticipated other than the already-announced cutbacks in tank and truck production.
- **Electronics:** only cutbacks that can be anticipated are in vertical proximity fuses—and even these will be slight. The balance of the program will stay as is.

Under the overall plan, there is likely to be some reduction in defense contracting after the first of next year. Reason is that then is the time when deliveries of major items will begin to pose a problem to the Defense Dept. Rather than accumulate tremendous war reserves on a continued production program, the military will then have to begin a shutdown on some lines. One or two lines will operate on a reduced basis, with the rest on a standby status. But even this change will be a gradual phasing-out rather than a sweeping readjustment.

Installing the Southwest's Largest

POSITIONING THE BED for the 7000-ton press. Excavation for the press is 22-ft deep, 10-ft across



MOVING THE 180,000-LB PRESS HEAD INTO POSITION. Outboard rigging is used to raise the head to elevation prior to moving it into place over the press bed. Reinforced concrete foundation is 19-ft deep

Ford Livonia Tank Plant First to Be Mothballed Under Ordnance Cutbacks

DETROIT — First major production package of machine tools to go into retirement following the recent Ordnance Dept cutback in tank and vehicle production will be at Ford Motor Co's Livonia, Mich, tank plant.

All government-owned machine tools and equipment now in the Livonia plant will be stored in a building a half-mile from the plant by January 1, according to Brig Gen Carroll H Dietrick, commandant, Detroit Automotive Center.

Invitations to bid are now going out to contractors. Plans call for a 1000-ft-long, 300-ft-wide "austerity" building — a double-walled, heavily insulated quonset hut. Dehumidifying equipment will be installed to maintain a constant 40% humidity. This controlled humidity will make mothballing of individual items of equipment unnecessary. In effect, the building will be a "cocoon."

About 1200 machine tools will be stored in the new building, representing an acquisition cost of about $25 million. In addition, about $10 million worth of special tooling will be stored, as will approximately $5 million worth of miscellaneous equipment.

Ford is buying the building site, will then lease the land to the government on a long-term basis with an option to buy.

The Livonia warehouse will cost about $1 million to build. Cost of storing the Livonia package: about $100,000 a year.

Aside from the so-called "proximity storage" method being carried out at Ford Livonia, the Ordnance Dept has devised three alternative methods of keeping intact the 80-odd tank and automobile production packages that will result from a shutdown of plants in several areas:

- **Tools can be kept in use.** This is considered the most desirable method by Ordnance and is being done at Studebaker, where the company will lease machine tools for its civilian production lines at an annual rental of $24,000.
- **Tools can be left in place,** with the government paying the cost of storing them.
- **Tools can be shipped to a US depot** and stored by the government.

Ordnance officers believe that if word to start building tanks should be passed to Ford or any other producer that has stored tools and equipment, the first tank would be off the line within 12 months.

SHORT RUNS . . .

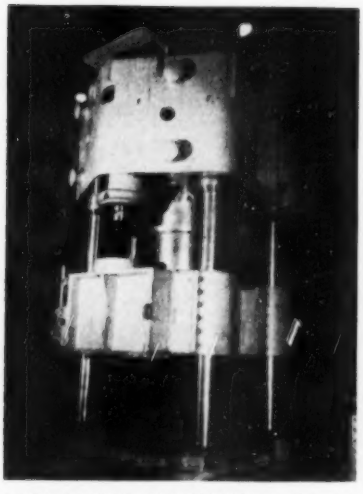
• Canadian auto output kept pace with the US boom during the first half of the year—40% ahead of 1952's first half. And the market shows no signs of falling off, except in the export truck market—off 10%. In first half 1953, Canada produced 253,150 vehicles, against 185,645 for the same period in 1952. Employment in Canadian auto industries was 40,000 at the end of June, compared with 36,200 in June '52.

• Largest single voluntary refund of allocated funds in Ordnance Dept history was made early this month when American Car & Foundry Co turned back $22.5 million to the Army. AC & F, which makes armored vehicles, says the refund is due to increased plant efficiency, new methods.

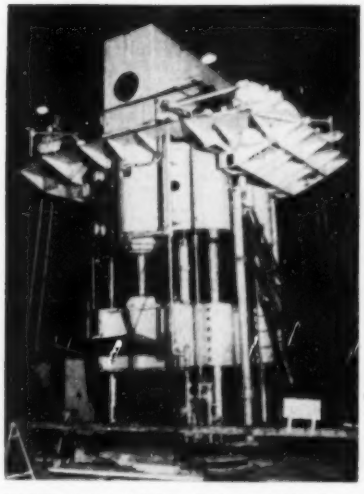
• By 1958, 50% of US homes will be air conditioned, an industry official predicts. And by the end of this year, he says, some 75 firms will be in stiff competition for the air conditioning market.

• Hungarian machinists have come up with a sonic clothes-washing machine that will do an average wash in 10 min. Clothes are placed in a tub of detergent, then high-frequency sound waves produce 100 vibrations per second to shake the dirt out.

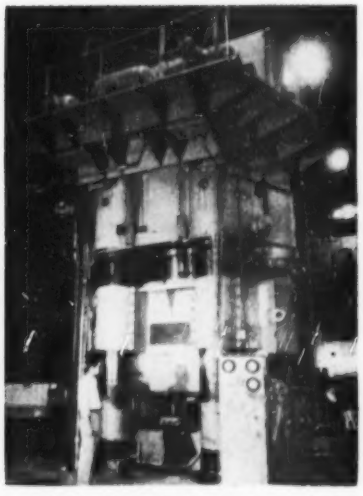
Hydraulic Press at Convair Fort Worth



MAIN HEAD IN POSITION after being lowered over strain rods and main ram. Main slide is at bottom



PUMP IN PLACE ATOP PRESS as machine starts to take final form. Hydraulic oil tank holds 3300 gal.



PRESS IN ACTION. Proof runs being made on the $500,000 press, capable of producing pressures of 10,000 psi

Plant Expansion

American Appliance Co started work August 1 on its new $750,000 Santa Monica, Calif, plant for manufacturing gas water heaters.

Hanchett Mfg Co has started construction of a new factory, warehouse and office building at Macadam Ave and Flower St, Portland, Ore, for manufacturing its line of saws and knife grinders.

General Electric Co will build a modern manufacturing plant at Jonesboro, Ark., to house part of its Specialty Fractional Horsepower Motor Dept. Plant, which will employ 300, will be completed in early 1954.

John Hassal, Inc, nail, rivet and screw manufacturer, has moved into a new plant at Westbury, L I, N Y.

American Floor Surfacing Machine Co is building a 100-ft, two-story extension to its Toledo plant for manufacture of its floor sanding machine line.

Bendix Aviation Corp is adding a 103,250 sq ft plant to its Eclipse-Pioneer Div at Teterboro, N J. The new building, to be known as Plant No. 2, will be ready in September and will manufacture aircraft instruments.

Defense-to-Civilian Tooling Trend Reported in US Metalworking Centers

MILWAUKEE — Defense tooling makes up 50% of tool and die shop volume in only four areas today, it was reported here at the quarterly meeting of National Tool and Die Manufacturers Association trustees July 24-25.

The areas are: western Massachusetts, 90%; central Connecticut, 80%; Los Angeles, 75%; and Cleveland, 50%. Elsewhere, defense tooling is rapidly being replaced by tooling for civilian products. Notable in this category is Detroit, where defense tooling has dropped to 2%. The outlook for increasing changeover from defense to civilian tooling in most areas is good, the trustees were told.

Apprentice Ratio Change

NTDMA voted to urge its member shops to increase the ratio of apprentices to journeymen to 1 for 5. Pointing out that today's high-production methods require more skilled tool and die makers than ever before, NTDMA First Vice President H C Murrer said:

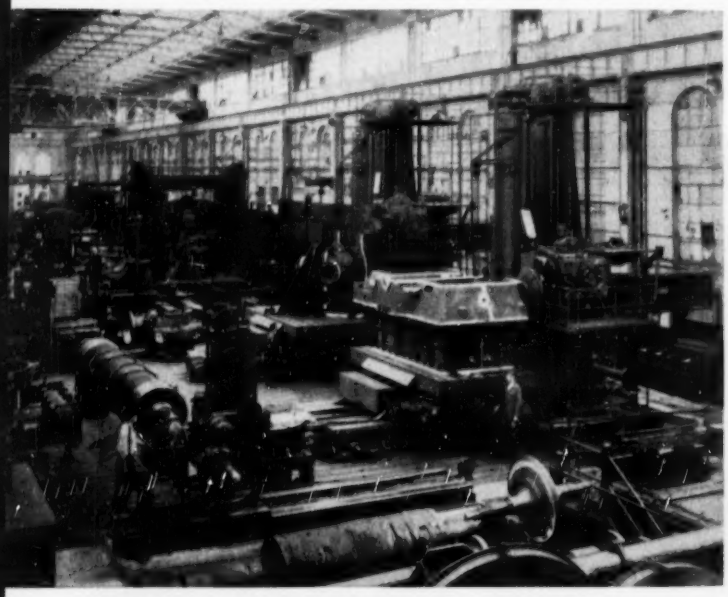
"It is not a case of shortage. It's simply that tools and dies today operate under higher accuracies and speeds than ever before. We need more and better skills to produce and maintain them.

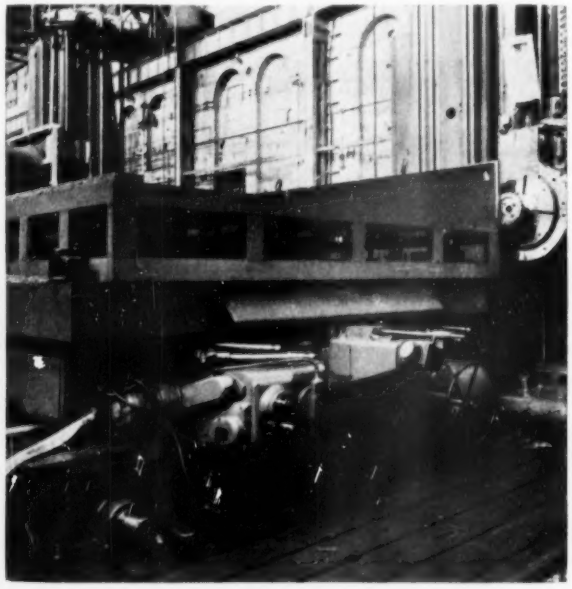
"The best way to get these skills is in the apprenticeship stage," he concluded. "A survey we have been conducting shows that the ratio of apprentices to those directly engaged in tool and die making must be increased."

APPRENTICE TRAINING FILM AVAILABLE

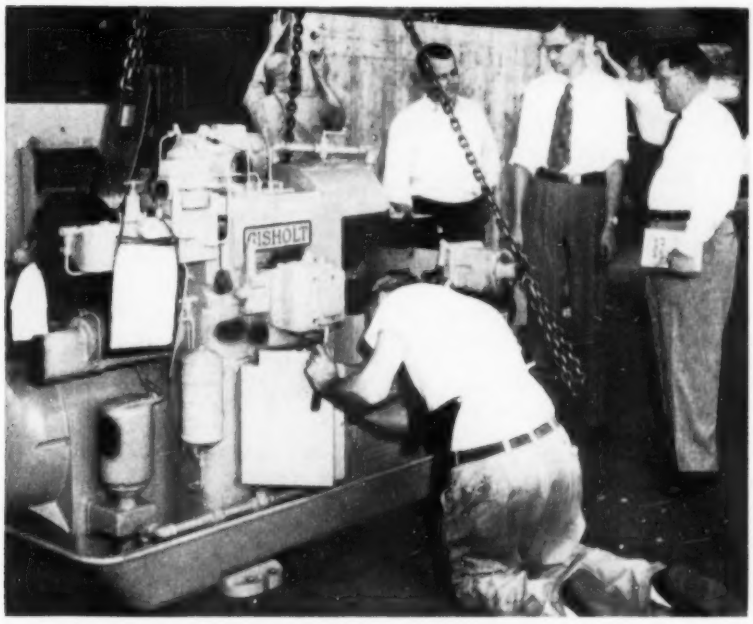
WASHINGTON — A documentary film on apprentice training is now available to private groups without charge from the Bureau of Apprenticeship, Department of Labor, regional offices.

The film shows how a high-school graduate becomes a brick mason's apprentice and works his way up to journeyman status. Explained in the film are: functions of joint committees; related instruction; the learn-while-you-earn plan; and how to increase the effectiveness of apprentice training through employee and supervisory aid and cooperation.





COMPOSITE MACHINING OF TURBINE CASINGS has effected a reported 50% savings in milling time at British Thompson-Houston Ltd, Rugby, England. One duplex and two single horizontal milling, drilling and boring machines are located on three sides of a 53x34-ft T-slotted floor plate, accurately leveled from beneath by jacks. By this method, only 3-4 crane lifts are required where 16 were needed before. At right is one of two rotating-table units 14x8 ft, used over the plate. Each can be rotated through 360°, also traversed and fed longitudinally by built-in motors.



BOUND FOR EUROPEAN MACHINE TOOL EXPOSITION, to be held in Brussels in September, is this No. 12 hydraulic automatic lathe, one of four machines to be exhibited by Gisholt Machine Co, Madison, Wis. Watching a mechanic put finishing touches on the machine are, left to right, Norval A Fournier, Hobart S Johnson II, and Eugene A Coombs, all of whom will man the Gisholt booth at Brussels

Leasing Policy Unchanged as ODM Revamps Tool Inventory Setup

WASHINGTON — After months of bureaucratic squabbling, the Office of Defense Mobilization has reorganized management of idle, government-owned machine tools and other production equipment. But it's mostly a matter of red-tape changes. No important change in leasing policy is contemplated.

The Production Equipment Central Inventory Group, comprehensive stock of equipment owned by all government agencies, has been abolished. The Inventory Group had been managed by NPA.

Now, ODM has placed it with two distinct inventories:

- One will consist of tools owned by the military services, plus the WWII National Industrial Equipment Reserve. This will be managed by the Defense Dept.
- The other will be managed by the Commerce Dept through its new Business Services Administration and will consist of idle tools owned by General Services Administration and other agencies.

Included in the Commerce Dept's Mobilization Production Equipment Inventory will be all equipment acquired by GSA through its facilties expansion, pool orders and "elephant tool" programs. These will not be leased.

Bulk of the tools, about 80%, are owned by the Defense Dept, whose officials are reluctant to estimate size or value of the inventory. The Pentagon has long clamored for return of these tools to its own management, while the civilian mobilization agencies advocated central leasing through the National Production Authority.

Defense Dept is drawing up detailed leasing rules for its tools and it is expected that the tools will be leased to military and defense supporting contractors, but only when the contractor is unable to obtain equipment from normal sources in time to meet requirements. No leasing will be permitted for commercial use.

Contractors will be able to lease tools only when certified by BSA's Metalworking Equipment Division.

Metalworking Abroad

(McGraw-Hill World News)

SWITZERLAND — Capital goods manufacturers here are advocating new Swiss credit and export insurance policies as a means of offsetting the current decline in export orders, i.e, Swiss exporters want to be allowed to help financially-strapped countries buy Swiss machines on long-term credit.

BRAZIL—Here are Brazil's current machinery and vehicle import needs, according to industry-wide surveys: automotive industry, $56 millions for the next 12 months; agricultural machinery, $14 millions for the last two quarters of 1953; mining and construction machinery, $7 million for two years; industrial machinery, $185 millions for an unspecified period; and airplanes and parts $4 million, for an unspecified period.

AUSTRIA — This country's largest lathe has just been put into operation at Rottenham by Hammerle Co. Bench is 100-ft long, uses mechanical power to achieve 100-metric-ton pulling power. Five-fold special chain is used to transmit power from 170 hp motor to the bench.

RUSSIA — The Soviet machine-tool industry and metallurgical industry both failed to live up to production quotas for the first half of 1953. According to Izvestia, the machine-tool industry exceeded its quota but was deficient in production of forging presses. Metallurgical industry fell short in production of several types of rolled iron.

AUSTRALIA — General Motors-Holden, GM's Australian subsidiary, is increasing production of Holden cars, expects to have an output of 203 cars per day by year's end. If the market keeps up, GM-Holden will up its output to 250 cars a day in 1954. Part of the increase is due to the addition of a luxury model earlier this year. GM-Holden's 1954 goals: 55,000-car output, a $25 million expansion of local manufacturing facilities.

TURKEY — An Austrian-Turkish business combine plans to finance an 8-15 hp diesel engine manufacturing plant in Istanbul. The Turkish group would put up a third of the money: the Austrians would furnish the machine tools. Discussions are now underway on how to finance the balance of the cost—about half.

WASHINGTON BRIEFS . . .

• The Government has entered into its largest subsidized titanium project with Cramet, Inc, wholly-owned subsidiary of Crane Co, Chicago. Cramet will produce 30,000 tons of titanium sponge during 1955-60. The deal will boost US primary titanium capacity to 13,200 tons annually by 1956.

• Full review of the entire defense setup by the Joint Chiefs of Staff has started in the Pentagon. Their recommendations, already promised Congress by Defense Secretary Wilson, are due Oct 1 at the latest. The Joint Chiefs' analysis of needs in terms of men, money and equipment will guide next year's military budgeting.

• The military has set up three regional Industrial Security Boards to handle security problems of defense contractors. The boards—located in New York, Chicago and Los Angeles—will review findings of investigative agencies concerning contractors and employees who are working on classified military contracts. The boards will have the power to grant or deny clearance to firms for work under contracts where a military department has previously turned them down for security reasons.

• US Dept of Labor's Bureau of Labor Statistics has just published "Employment Outlook in Metalworking Occupations," a 38-page booklet taken from the Bureau of Labor Statistics' 1951 Occupational Outlook Handbook. Designed to furnish students, teachers and vocational counselors with accurate information concerning chances for employment in the metalworking industry, the booklet covers three principal trades: (1) machine-shop occupations, (2) foundry occupations, and (3) forge shop occupations, plus such miscellaneous trades as millwrights, blacksmiths, welders, assemblers, etc. Nature of each type of work, earnings and working conditions, and employment outlook for each are given. Bulletin 1130 is published in conjunction with the Veterans Administration and is available from the Superintendent of Documents, United States Printing Office, Washington 25, D C. Price: $.30.

NPA Assumes Peacetime Role As Business Services Administration

WASHINGTON — The Korea-born National Production Agency converts this month from an emergency controls agency into a peacetime "Business Services Administration."

BSA'S function will be twofold:

• **Controlling mobilization controls** still on the books

• **Promoting business interests** — a traditional Commerce Department function.

The first of these functions will include (1) managing the new Mobilization Production Equipment Inventory (non-military, government-owned idle machine tools; (2) rationing nickel, nickel-bearing stainless steel and columbium-tantalum steels; and (3) running the Defense Materials System.

BSA will have less than 400 employees working in its 15 industry divisions. (24 divisions were originally planned). The new agency will absorb the Commerce Dept's old-line Offices of Business Economics, Technical Services, Small Business Agency and field services. Rounding out BSA's organization will be an Office of Mobilization Programs Coordination.

Industry divisions will play a part in both mobilization and service programs. Under the latter, an industry division will be the contact for a company or industry with a government problem.

Two Metalworking Branches

BSA's Metalworking Equipment Division will be essentially the same as NPA's. But other hard goods divisions may merge with it because of budget cuts. The Metalworking Division now has two branches: industry service and defense activities.

V J Rigotti heads the industry service branch, which deals with specific product problems, machine-tool industry participation in mobilization base and post-attack planning, and materials procurement for tool builders. Mr Rigotti's aides are J Shiels, J F Fitzgerald, P M Hall and E J Masterson.

J M Lawson is chief of the Defense Activities branch. His aides are H E F Hawkins and M R Sutherland. This branch's most important job from now on will be the task of overseeing the idle tool inventory. This branch will be given the power to certify government contractors to lease equipment from General Services Administration.

Defense Activities branch will also take charge of pool orders, facilities expansion and the "elephant tool" program. Machine tool companies seeking fast tax writeoffs, government loans and other expansion assistance will work through this branch.

Perrin G March, III, president, Cincinnati Shaper Co, will continue as director of the Metalworking Equipment Division. Samuel N Comly, vice president, Russell, Burdsall & Ward Bolt & Nut Co, is assistant administrator in charge of BSA's industrial and agricultural equipment divisions.

Elgin to Diversify Product Lines

NEW YORK—The 89-year-old Elgin National Watch Co is looking for new industrial fields to conquer as a means of offsetting cyclical and seasonal business declines, Elgin President J G Shennan said here at a recent press conference.

Elgin seeks to affiliate itself with firms in either the electronics or precision production instruments fields, where Elgin precision craftsmanship can perfect existing or experimental products and components. To illustrate, Elgin could apply precision miniaturization techniques to portable radio production by reducing transistor and component sizes to a point where the radio would easily fit in a shirt pocket. Or the same techniques could be applied to production of hearing aids to reduce their size.

Elgin, whose production of jewelled watches will in no way be affected by its entry into new fields, has prepared an "enterprises wanted" brochure for distribution to banks, business brokers and inquiring concerns. And the company has set up a commercial development department to make basic investigations of prospective affiliates and to separate likely and unlikely prospects making inquiries.

US Army, Marshall Plan Responsible for Rebirth Of German Machine Tool Building Firm

FRANKFURT, GERMANY (McGraw-Hill World News)—Dramatic postwar reconstruction of one of Germany's most prominent machine-tool building firms is due in a large measure to the US Army.

Just before the Russian armies overran Leipzig in 1945, American Army trucks carried the top 10 executives of Pittler, German turret lathe producers, to safety in the US Zone, along with truck loads of blueprints and papers. The Leipzig plant is now a Soviet-controlled firm manufacturing experimental lathes for shipment to Russia.

Following their dramatic rescue by American GI's, Pittler executives vegetated in an American camp near Frankfurt. Then in 1947 the firm's head, Dr Wilhelm Fehse, contracted with another German metalworking company, Nassovia Maschinenfabrik, to repair machines.

In 1949, Pittler started making turret lathes. Two years later, the company opened a new 4000-sq-meter plant at Langen, employing some 600 workers. Today, the Langen plant is turning out about 30 turret lathes in six models per month. And the company has a license to build four- to six-spindle automatics under a prewar agreement with National Acme Co, Cleveland.

The Marshall Plan was largely responsible for Pittler's reconstruction. All told, 4 million marks were granted the firm for building construction and purchase of machinery and fixtures. The loan, underwritten by the State of Hesse, must be paid back by 1960. Pittler made its first payment of 150,000 marks this summer.

During the Korean War, Pittler manufactured up to 40 lathes a month, but this schedule has been cut back to 30 per month. The company is still working on an order for 150 machine tools for Britain's Royal Air Force.

England is Pittler's best customer, followed by the US, Switzerland, Sweden, Belgium, France, Spain, Latin America and South Africa. The Japanese have ordered five lathes.

Loss of Red Market Felt

Pittler this year turned down inquiries from Red China and other Soviet satellites. But company officials frankly admit they feel the loss of their traditional Eastern markets. Before the war, Eastern orders amounted to 30% of Pittler's output; in some years 80%. Pittler is worried about this and the continuing drop in export orders. Although in the last two years Pittler has sold "more than we ever expected" to the US, the American market is now stopped completely.

Although most German machine tool builders feel that German rearmament will take up the slack in orders, Pittler officials are pessimistic on this score. Although they feel that rearmament demand will be slow and that existing capacity can easily fill demand, Pittler's heads admit they have already had inquiries from Heinkel and Messerschmidt. These inquiries are expected to result in concrete orders when Germany's aircraft industry gets the green light from the Allies to start production again.

Delivery Time: 6-8 Weeks

The continuing drop in orders now plaguing the German machine tool industry is mirrored by Pittler's delivery dates—established models can be delivered in 6-8 weeks; only such new models as the Pirex 80 require 6-8 months.

Labor-management relations at Pittler are excellent. About 50% of the workers are unionized. Some 100 workers and clerks have managed to make their way from the East Zone to Langen in recent years. And the many father-son teams at Pittler are an evidence of worker loyalty.

PITTLER'S 40,000-SQ-FT MACHINE TOOL PLANT AT LANGEN, GERMANY, has been in operation since 1951, employs some 600 workers

TOOL AND DIE FILM PREMIERE SET FOR SEPT 16

MILWAUKEE — First complete sound-color film dealing exclusively with tool and die making, "Tool and Die Making—Keystone of Mass Production," was shown here recently at the quarterly meeting of National Tool and Die Manufacturers Association trustees.

The film will be premiered September 16 in New York City before leaders in the metalworking and education fields and government officials. Later, it will be shown in 23 leading tooling centers.

Sponsored by NTDMA, the film shows how tool and die making is responsible for low-cost, mass-production of interchangeable parts. The film follows the progress of an apprentice through his 8000-hr training period and shows production of such diverse products as zippers and auto tops.

Distributors Named

Kurt Orban Co, New York—for German-made **Wafios** wire forming, wire netting, spring making and nail making machinery in the US.

Di Eugenio Tool Center, 119 S 11th Ave, Phoenix—for **Ready Tool Co's** line of anti-friction, high-speed and carbide-tipped centers in Ariz, N M, Colo.

Ronald A Larsen, Houston — for **Utica Drop Forge & Tool Corp's** pliers, adjustable wrenches and screwdrivers in S Texas, La.

Keller Tool-California, Inc, 1053 W 7th St, Los Angeles; sales subsidiary for **Keller Tool Co.**

Pearce Tool & Gauge Co, Chicago—for **Schauer** speed lathes in N Ill., Wis, E Iowa, N Ind.

H Wilson Ryno, 1060 Broad St, Newark, N J—for **Columbia Tool Steel Co** in N J and N Y.

Tool Specialists, Inc, 891 Prospect Ave, Westbury, L I, N Y— for **Adamas Carbide Corp's** line of carbide tools, tips, dies and wear parts in northern N J. Tool Specialists will maintain a branch office at 694 Bruce St, Ridgefield, N J.

Kramer Industrial Sales Co, 312 E Wisconsin Ave, Milwaukee, for **Poole** flexible shaft couplings in Wis and E Iowa.

J Pegley & Son Hdw Co, Pottstown, Pa—for **Cleco** and **Dallett** air tools and accessories.

NY Firm's "Permanent Machine Tool Show" to Feature US, Foreign Makes

BROOKLYN, N Y—Plans for the establishment of a permanent machine tool show in this city have been announced by S & S Machinery Co, 140 53rd St. Some 200,000 sq ft of floor space is being made ready for a formal opening on October 15.

Machines on display will range from large boring mills to bench lathes, and will include all sizes of radial drills, engine and turret lathes, milling machines, grinders, shapers, jig borers, internal and external grinders, tool grinders, surface grinders, and equipment for sheetmetal work, forging, and shearing.

The greater portion of the equipment to be shown will be of Italian origin, but French, German, and American machines will also be included. All machines will be under power, and experienced demonstrators will be available to operate them under actual shop conditions. All equipment, S & S points out, will be fully guaranteed and serviced by its own staff, eliminating difficulty of servicing foreign machines.

This display is believed to be unique in the machine tool field, and the company announces that it will be the most complete line of toolroom, production, and fabricating equipment to be found anywhere under one roof. It will be possible for a visitor to compare as many machines for a 15c subway fare as he could see in a 10,000-mile trip abroad, S & S officials say.

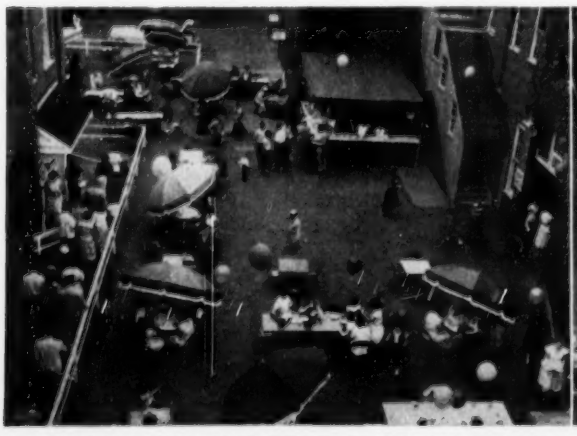
Dodge Mfg Corp Celebrates 75th Year

MISHAWAKA, IND — Dodge Mfg Corp launched its fourth quarter-century with a series of plant and community events, climaxed by an open house at its plant here June 17.

More than 3200 guests from Mishawaka and nearby South Bend, including families of employees, participated in a series of guided tours of the plant and were served refreshments in the company courtyard, transformed into a garden for the occasion.

Another highlight of Dodge's 75th Anniversary observance was a testimonial luncheon two days previously, when Mishawaka's Mayor E Spencer Walton presented Dodge President Joseph E Otis with a plaque commemorating a resolution of the City Council commending Dodge on its three-quarters-of-a-century of service to the city.

Other features of the anniversary included informational programs put on by Dodge officials for Mishawaka civic and service clubs, special stories and pictures in local newspapers, and a series of radio and television interviews on company activities.



A GARDEN PARTY AND THREE BUDDING MACHINISTS were all part of an open house commemorating Dodge Manufacturing Corp's 75th anniversary, July 17 at Mishawaka, Ind. Left: some of the 3214 guests enjoy refreshments in the garden set up in the plant courtyard. Right: three interested young men watch machining of bearing sleeves

A W Johnson

H U Herrick

H V Bailey

W T Llewellyn

Names in the News

A W Johnson has been named manager of manufacturing for Caterpillar Tractor Co's new motor grader and industrial wheel tractor plant, to be built 70 miles south of Peoria, Ill. Mr Johnson, who has been with Caterpillar since 1928, was formerly in charge of tractor manufacture at Peoria.

Howard U Herrick, president of E W Bliss Co, Canton, Ohio, has entered into an agreement with the company extending his services as senior executive officer for seven years. Mr Herrick, who was executive vice president from 1934 to 1944, rejoined as company president in 1951.

James B Qualters, assistant to the plant superintendent at Townsend Co's main plant at New Brighton, Pa., has been named plant manager of Townsend's Chicago plant, succeeding **Ralph E Johnson,** who becomes plant superintendent of Townsend's Canadian affiliate, Parmenter & Bullock Mfg Co, Gananoque, Que.

Harold V Bailey, assistant sales manager of Greenlee Bros & Co's Screw Machine Department, Rockford, Ill., has been named sales manager of the Department, succeeding **Ed Kelly,** who is retiring after 23 years with Greenlee. Mr Kelly, who has been sales manager of the Screw Machine Department since 1943, will retire to Somerville, Texas, where he formerly resided while in the employ of the Santa Fe Railroad. His successor, Mr Bailey, has had broad experience in servicing Greenlee screw machines and has traveled widely in a sales capacity in this country and in Europe.

W M Truska, Jr, has been appointed European sales representative for Hydraulic Press Mfg Co's new press manufacturing center, Hydraulische Pers Maatschappij, Amsterdam.

W S Rheem II has been promoted from Western division manager to assistant general manager for Rheem Mfg Co. He is succeeded as Western division manager by **E C Bergen**.

William T Llewellyn has been elected president, and **Matthew J Scammell, Jr,** executive vice president of S L Allen & Co, Inc, Philadelphia.

Athel F Denham, president, Denham & Co, Detroit, left New York August 17 to attend the European Machine Tool Exhibition, Brussels, as official delegate representing the American Society of Tool Engineers. While there, he will visit several European industrial centers.

James F Strnad has resigned as president of Lempco Products, Bedford, Ohio, and will be succeeded by his son, **James J Strnad,** formerly vice president and general manager. The elder Mr Strnad will continue as board chairman of Lempco and its subsidiaries: Lempco Automotive, Inc, Evans Reamer & Machine Co, and Lempco International, Inc. **William J Blazek** has been advanced to the presidency of Evans Reamer & Machine Co; **Albert B Harding** to the presidency of Lempco Automotive, Inc; and **Miss Dorothy R Kimmel** to vice president and general sales manager of Lempco International, Inc.

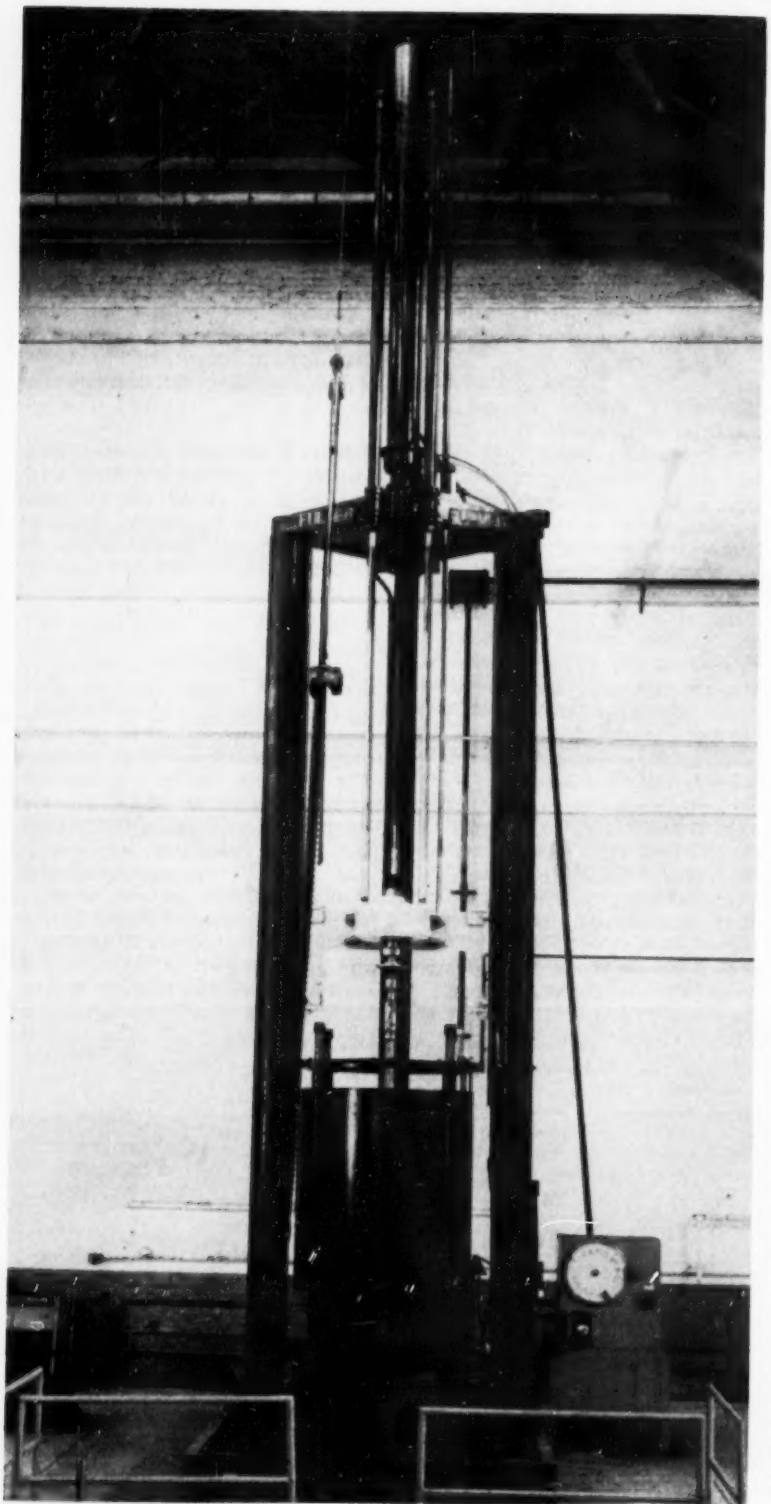
J B Qualters

W M Truska, Jr

J F Strnad

J J Strnad

New Shop Equipment



Official Photograph U S Navy

Hones 30-ft

This line of large Fulmer vertical honing machines can be obtained with maximum stroke length from 96 to 144 in. and can be tooled for honing capacities up to 54 in. This particular machine, Model 30/144, was ordered by the Navy to hone catapult cylinders up to 30 ft long and has a working stroke varying from 10 to 144 in., a cylinder-bore-diameter capacity from 4 to 36 in.

Honing such cylinders in a horizontal position invites trouble because the weight of the tool tends to prevent uniform honing. It is extremely difficult to obtain a round and straight bore. On the other hand, it is impractical to hone such long cylinders vertically with one full pass. As a result, Fulmer, in cooperation with Navy officials and engineers, departed from conventional honing practice and arranged to hone the bore vertically in increments.

HONING METHOD

The catapult cylinder, being 2½ times as long as the working stroke, is honed in three sections. Handled by a crane, the cylinder is mounted through the table of the machine with most of its length suspended in the pit. The lower end rests in an adapter plate counterbore which locates the cylinder. An upper breech locking ring, carrying an adapter plate, is placed within the upper fixture member. The cylinder is clamped endwise between the upper and lower fixture.

The top section of the bore (up to 12 ft) is first honed to size. Then, after withdrawing the honing tool and driving the table back to loading position, the cylinder is turned end for end and brought back under the spindle. When both ends have been honed, an extension is added to the shank of the honing

FULMER 12-FT-STROKE MACHINE vertically hones cylinder bores 30 ft long in three sections and attains taper of 0.0002 in. end-to-end (average). Machine was erected at the Phila Navy Yard by the Naval Aircraft Factory

Materials and Parts

Bores Vertically in 3 "Takes"

tool to reach the unhoned center section. By honing in sections, cylinders with lengths to 36 ft can be handled.

New Alexander Ball honing tools were developed for this machine. The cylinder diameter after honing is not affected by stone wear because the measuring device built in the hone body registers the actual bore diameter at any point. Readings are made on the remotely located dial indicator which indicates actual diameter to the nearest 0.0001 in.

Fulmer states that the Navy inspectors found the finished cylinders well within allotted tolerances. The average taper throughout the bore was 0.0002 in. Out-of-roundness of the bore was 0.0001 in. The finish was found to be 11 mu in. rms. Fulmer guarantees a maximum change in diameter from end to end of 0.0005 in. and a max shoulder height at junctions of separately honed increments of 0.00025 in.

MACHINE DESCRIPTION

The machine stands about 45 ft above floor level and the pit is 24 ft deep. The ball bearing table, 60x72 in., carries a 46-in.-dia hole through which long cylinders are suspended. Table travel is 5 ft to enable the center of the table to clear spindle centerline so work can be loaded directly from the crane.

Spindle drive is through two gear boxes with eight spindle speeds, changeable from the floor, and a reduction gear box mounted on the ball bearing crosshead, transmitting power to the 4⅜-in.-dia spindle with flanged nose to which honing tools are attached. To keep the height low, twin hydraulic cylinders are used. Each carries seven piston rings with the piston rods transmitting their thrust to the reduction gear box on the crosshead. The ball bearing table is actuated by an independent hydraulic system, including pump, controls, and motor. When the table is away from the honing position, an interlock relay prevents either the main spindle or the hydraulic pump motors from starting. Hydraulic counterbalancing of the reciprocating mass is incorporated in the circuit.

OPERATIONAL CONTROLS

The pendant control box can be actuated from the floor or elevated platform. Button marked "Hone" starts simultaneous rotation and reciprocation. Other buttons control rotation-only, inching-rotation, reciprocation-only, inching-reciprocation, stop and dwell, and the coolant pump. There are two master stop buttons, one on the pendant and the other at floor level. A horsepower meter indicates power being applied to the honing tool.

Pressing the coolant button starts the coolant pump and a scavenger pump that picks up oil from the bottom of the cylinder and delivers it through a magnetic separator into the coolant reservoir in the base.

The Fulmer stroke-control system allows the stroke dogs to be set for any stroke from about 10 in. up to 144 in. Spindle movement between dogs is indicated by graduations on the face of the feed disk. One dog is retractable so, without changing the setting, the spindle can be withdrawn from the cylinder. Short-stroking of the spindle can be done at any point within the stroke setting.

For finishing work too large or heavy to be mounted on the table, machine is available with spider base so it can be mounted directly on the work itself.

C Allen Fulmer Co, First National Bank Bldg, Cincinnati 2, Ohio

SPECIFICATIONS

Working stroke	96 to 144 in.
Honing capacity	4 to 36 in.
Spindle speeds	13, 20, 29, 43, 55, 80, 85, and 116 rpm
Spindle drive motor	40 hp
Reciprocating speeds	0 to 75 fp
Hydraulic pump motor	25 hp
Dwell period (adjustable)	max. 30 sec
Table pump motor	3 hp
Coolant capacity	450 gal.
Floor space	136x220 in.
Weight	35,000 lb

... INCLUDING

Bar machine has two independent spindles; stock and drill are simultaneously rotated in opposite directions page 156

Strip-feed press provides for one-hour production run before reloading page 157

Laminated plastic retainers allow precision bearing speeds to exceed 100,000 rpm page 157

Power press brakes, 6- and 8-ft capacities, feature precision ram adjustment and ball bearing flywheel page 158

All-geared-head engine lathe incorporates many safety features making it ideal for training use page 160

Horizontal boring mill, equipped with power rapid traverse in all directions, has 29½-, 35-, or 43-in. vertical capacity page 164

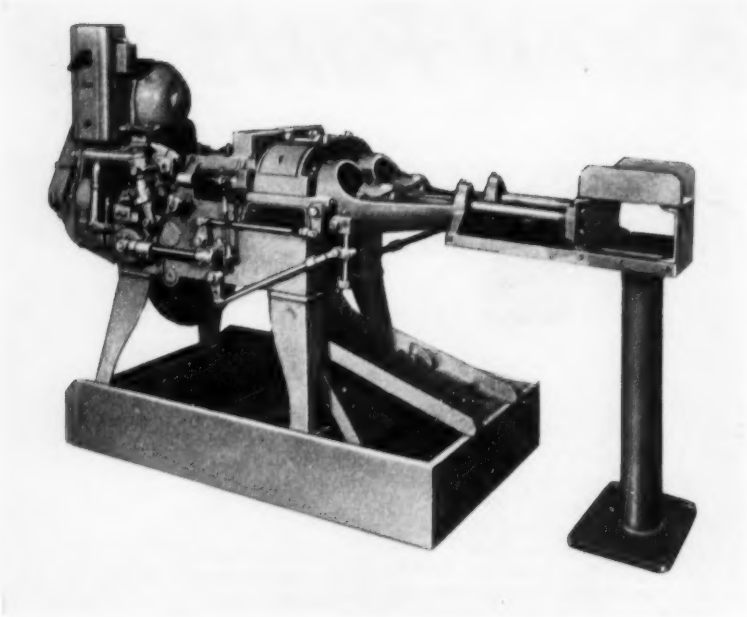
Variable speed changers are available with three types of geared controls—spur, miter, or worm page 166

Magnetic pick-up tools of various shape and design enable removal of loose metal parts from inaccessible spots page 168

... and in Aug 31

Hole-piercing and notching units mount on lower press bed to eliminate customary die sets.

Automatic diamond turner, electro-mechanical, indexes diamond by positive, precise increments.



Improved Budd-Ranney Bar Machine Has Two Independent Spindles

The improved Budd-Ranney automatic bar machine, made by Miller Glass Engineering Co, is available in four models for fabricating nut blanks from ¼- to 2-in. dia. The three smaller machines (handling nut blanks up to 1½ in. in dia) have twin spindles which may be operated independently of each other. If desired, one spindle may be used for making one size of nut and the other for a different size. The two sizes may be cut simultaneously and each spindle can be driven at the proper speed for the size made.

Bar stock and drill are simultaneously revolved in opposite directions. Stock is rotated at the speed which will provide maximum results from side cutting tools without regard to drilling speed.

Instead of using a single cut-off tool, the machine divides the cut between two side cutting tools, termed roughing and finishing tools. Chip comes out as three separate chips, reducing rubbing at side of cut and retarding generation of heat.

Much narrower cutting tools can be used because of the side cutting tool construction. This results in higher nut production from a given length of stock. (An average 10% increase is claimed.)

Chuck is conventional draw-back, spring-jaw type with interchangeable chuck pads for various sizes of bar. However, instead of the chuck being drawn back by cam action, it is pulled back by the centrifugal force of rotating weights operating through levers pivoted in the chuck driving gear.

Chuck construction allows bar-stock sizes varying widely from nominal dimensions to be used without adjustment. With stock smaller than nominal size, weights swing out farther from spindle until chuck pads are firmly down on bar. If stock is larger than nominal, the outward swing is stopped sooner, but the gripping action will be secure.

Carried inside the feed-tube is a smaller tube which serves the purpose of expanding the feed-finger opening. Bar of stock can thus be passed through without jamming. When bar is at desired location, feed-finger is released so it will grip stock properly.

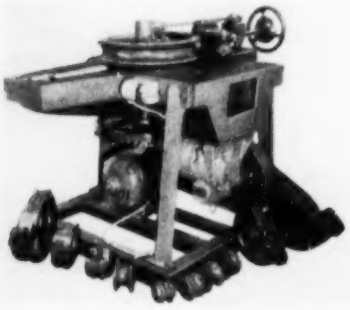
Each drill spindle is built in precise alignment with its corresponding stock spindle. For maintaining drill accurately concentric with the nut blank, a drill bushing, which also functions as a counterbore on some machines and as a stop on others, is located between end of drill spindle and end of bar stock.

Longitudinal travel of the drill spindle is actuated by the main cam. Provision is made through adjustable linkage for amount of travel, and proper location of the drill, as its length is changed by grinding.

Travel of the counterbore differs from that of the drill. It is retracted to give chip clearance as soon as the drill begins its cut, and again moves forward to serve as a stripper of the nut-blank from the drill as the latter cuts into the side-tool cut, severing the nut from the bar. When the drill guide is used as a positive stop, nut is cut off and not drilled off.

Standard equipment includes tooling for any one size of nut within capacity, stock-run for 20-ft bar lengths, cooling tank, coolant pump, main-drive motor, coolant-pump motor, and necessary electric switches and controls. Drills are not included in tooling.

The Miller Glass Engineering Co, 148 S Glenwood Ave, Columbus 8, Ohio



American Pipe Bending Machine for ½- to 2-in. Pipe

Machine 2PBR, added to American Pipe Bending Machine Co line, bends ½- to 2-in. pipe to minimum radius five times pipe size, maximum radius, 13 in. Included are standard 2-hp motor and drum-type reversing controller as well as rollers and quadrants.

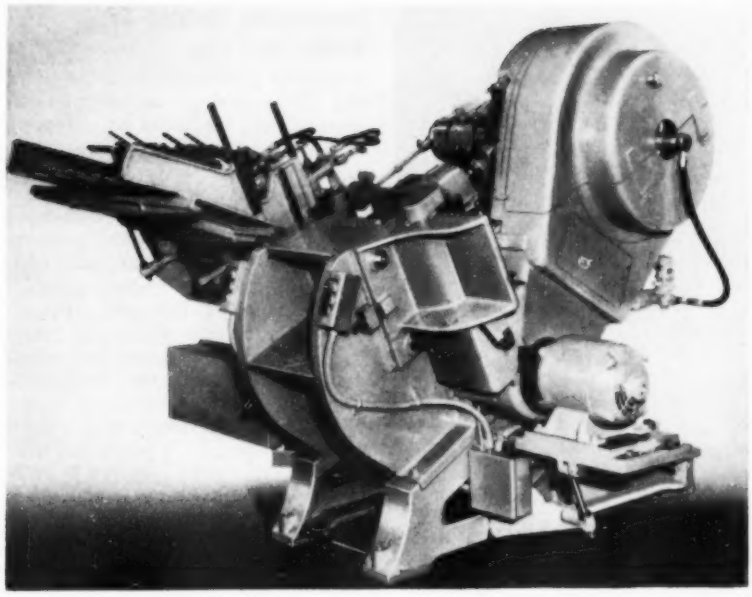
American Pipe Bending Machine Co, Poultney, Vt

High-Accuracy Micrometer Head Has Non-Rotating Spindle

Boeckeler micrometer head has been designed for the highest accuracy obtainable. Leadscrew is lapped to necessary accuracy to reduce error to 0.00001 in. Scale and vernier are engraved on barrel and each division of vernier calibrates 0.00002 in.

Back end of non-rotating spindle features a carbide wear tip. Leadscrew is hardened tool steel ground from solid. Adjustment between leadscrew and nut is provided.

Boeckeler Instrument Co, 91 E Rillito St, Tucson, Ariz



Hamilton Strip Feed Press Redesign Increases Speed

Hamilton No. 401 strip feed press for high-speed production of can ends, screw caps, and other light stampings, has been redesigned to increase speed with multiple dies. Continuous-feed stack now provides for one-hour production run before reloading. Machine is rated at 25 tons.

Improved frame design uses welded-steel structure to maintain alignment without tie bars. Use of Fawick Air-Flex clutch and brake directly on crankshaft is said to assure smooth starting, protection to crankshaft and dies, and practically instantaneous stopping.

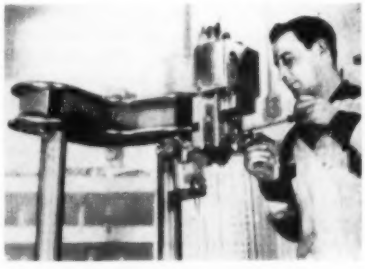
Sectional friction shoes in the clutch, applied by air-inflated tube, are reported to assure uniform pressure around drum, eliminate possibility of improper adjustment, and make wear compensation automatic.

Brake is disengaged instantly by air pressure as clutch engages and brake is spring-actuated at instant of clutch engagement. Press is stopped automatically if air supply fails.

Adjustable vacuum cutoff has been speeded up and simplified. Air supply line is completely closed before short lines to vacuum cups are opened to atmosphere. This unit operates in conjunction with crossfeed which takes strips from suction cups into and under fingerbar on table. Press operates on own vacuum system or any regular shop system.

Safety for operator is provided through two-hand controls and open electric circuit when flywheel guard door is open. Automatic lubrication is optional.

Baldwin-Lima-Hamilton Corp, Hamilton, Ohio



Flame Cutting Equipment Termed 3-Dimensional

Milwaukee Shipbuilding Corp terms its flame cutting equipment three-dimensional; intended use is for scarfing edges of curved metal pieces in preparation for welded assembly of larger units. Term 3-D is applied because, in addition to horizontal and vertical operation, unit operates around curves. Original application was in production of curved sections of tank armor.

Cutting flame slants at constant angle from desired apex of scarfed edge. The rise, falls, tilts, and turns of a system of twin rails match those of the metal under process. Four spring-loaded drive rollers and spring-loaded idler roller keep moving unit true to path of rails. Drive rollers move at speeds up to 15 ipm powered by 1/25-hp motor. One roller in drive group is serrated to prevent slippage when unit enters curve. The serrated roller cuts its own track in the guide rail which it follows.

Projecting inward toward metal being scarfed is a sector on which flame-cutting head is mounted. Head may be set at any angle job requires.

Although unit is made in standard size by Milwaukee Shipbuilding, each set of rails and accompanying fixture must be built for piece of metal being processed.

Milwaukee Shipbuilding Corp, 3718 W Lancaster Ave, Milwaukee 9, Wis

Plastic Ball Bearing Retainers For High-Speed Applications

Precision bearings capable of attaining speeds in excess of 100,000 rpm are said to be possible through the use of thermosetting laminated plastics fabricated into retainers by the Synthane Corp. Retainers for machine tools, grinding spindles, turbine and supercharge blowers, and aircraft instruments can reportedly be machined within the tolerances required for precision and super-precision bearings.

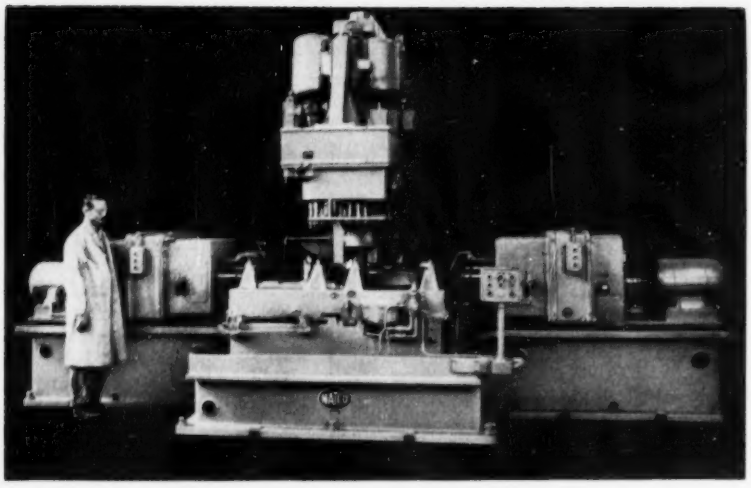
Due to the smaller masses involved, centrifugal forces are reduced. Starting torques are lower and more consistent. Galling is eliminated because laminates, while virtually impervious to oils and greases, do absorb small quantities of lubricant in the cotton fibers exposed during machining.

Synthane retainers are fabricated in various styles including single row, deep groove; single row, low-angle contact; single row, high-angle contact; and double row, self-aligning. Retainers run from ¼- to 33-in. OD.

Three major types of ball pockets are drilled at Synthane: the snap-in, the Cherry-reamed, and the straight-through. The snap-in pocket is designed so the ball must be forced into it. The Cherry-reamed pocket consists of a straight hole with a retaining shoulder at one end to prevent the ball from passing through.

Inspection is a vital part of laminated retainer fabrication. It is reported that dimensions are checked continually during manufacture and held from ±0.005 to +0.001 in., depending upon considerations of bearing design.

Synthane Corp, Oaks, Pa



Automatic Machine Drills and Taps Right-, Left-Hand Tank Case Parts

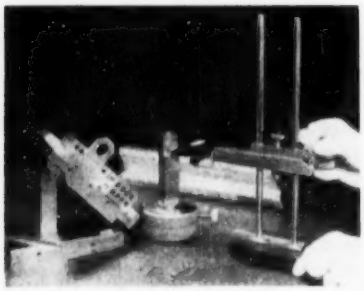
National Automatic Tool Co automatic Holetapper and driller is operated with pushbutton controls.

Left-hand horizontal head and vertical head perform the following operations on left-hand parts: Position 1, remove and load; Position 3, vertical head—tap 4 holes, LH horizontal head—tap 4 holes; Position 2, vertical head—idle, LH horizontal head—tap 3 holes.

Right-hand horizontal head and vertical head are arranged to perform the following operations on right-hand parts: Position 1, remove and load; Position 3, vertical head—drill 8 holes, horizontal head—tap 4 holes; Position 2, vertical head—tap 8 holes, horizontal head—tap 3 holes.

One operator handles the job.

The National Automatic Tool Co, Richmond, Ind



Indicator Height Gage and Inspection Block Speed Checking

Indicator height gage and adjustable inspection block have been designed for precision layout work. Gage, set to master parts or standard blocks, can be quickly adjusted to approximate height and locked in place; final adjustments can be made in millionths of an inch, with one hand, in far less time than usually needed.

Indicator assembly travels freely on two vertical parallel rods, locked with a knurled thumb nut positioned between; final adjustments in millionths of an inch are possible by a slight turn of the adjusting screw.

Inspection block, said to measurably reduce inspection time by elimination of trial and error readings of height gage, is adjustable in millionths of an inch through a range of 0.250 in. vertically. The 1¾-in.-dia anvil can be quickly raised or lowered with micrometer-thread knurled thumb screw for positive setting without bumping or tapping. Height gage is supplied with indicator holder and scribing attachment. Available 12, 24, 36 in. high.

The Tietzmann Tool Corp, Englewood, Ohio

Wireless Intercommunication System Uses Standard Power

Wireless two-station intercommunication system can be plugged into standard outlet. Device uses Sonic Gate circuit said to screen out line noises and hum. Unit is designed so that more stations can be added to the system at any time, all stations being able to receive messages from any point.

Talk-A-Phone Co, 1512 S Pulaski Rd, Chicago, Ill

Permanizing Claimed To Double Buff Life

American Buff manufacturing process, Permanizing, is claimed to double buff life. Used on company line of bias sisal buffs (conventional, permanent steel center, and patented centerless-type buff), process permanently locks together fibers of top-grade sisal fiber cloth woven to exact specifications and bias cut. Process is said to reduce fraying, prevent excessive hardness, give perfect finish, and eliminate many grease wheel operations. Air-conditioned buff construction reportedly provides cooler running at faster speeds and increases output.

Centerless type consists of individual buffs locked together to build up desired width. Special fingers are inserted with telescoping hollow shafts. Units are adaptable and fit any size spindle by varying diameter of arbor hole in flanges.

American Buff Co, 2414 S LaSalle St, Chicago 16, Ill

Semco Power Press Brake Has Precision Ram Adjustment

Semco 6- and 8-ft sheet-metal-forming power press brakes have ram and bed plates with lengths of 72 and 96 in. respectively. Die area of 12-in. shut height is provided with 3-in. stroke and 4½-in. adjustment of stroke.

Features of the machine include: precision adjustment of the ram (one rev of handwheel adjusts 0.008 in.); balanced cast steel flywheel runs on ball bearings; adjustable variable speed drive; foot treadle adjustable to any position of bed; die holder included as standard equipment.

Motor is 1½ hp and speed 1800 rpm. Variable range of 16 to 40 strokes per minute is obtained by handwheel adjustment. Prices of machines are $2975 and $3175.

Service Machine Co, Inc, 226 Miller St, Elizabeth 4, NJ

it pays up to 50% to think

FIRST

about last operations

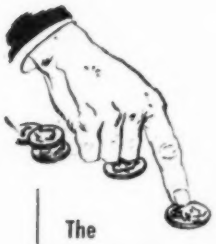
Parker-Kalon Self-tapping Screws have been cutting assembly costs of millions of metal and plastic products for over 35 years. Yet, today, thousands of manufacturers, who could gain the same benefits, still use such slow-down fastening methods as machine screws in tapped holes, bolting, and riveting. Why?

The reason is that too many product engineers think *last* about assembly because it is a final operation, then follow habit or custom in specifying fasteners.

Best way to make sure of savings you have been missing is to think *first* about fastenings . . . compare methods for simplicity, speed and security. Records show that in 7 out of 10 cases, P-K Self-tapping Screws show substantial savings, often up to 50% and more.

A P-K Assembly Engineer will help you get the facts you need. He'll call at your request. Parker-Kalon Corporation, 200 Varick Street, New York 14.

P-K Type A
— the FIRST Self-tapping Screw



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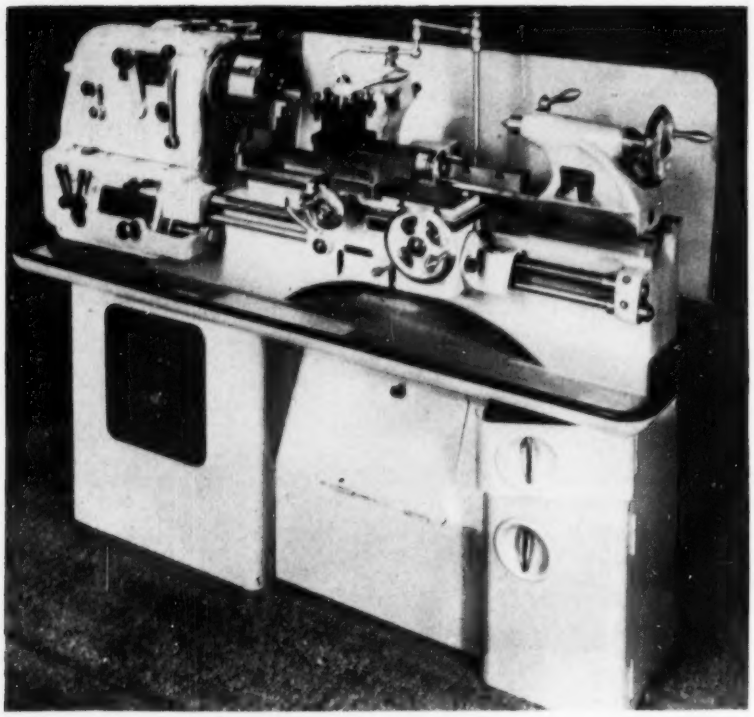
This mark △ on every P-K Self-tapping Screw identifies it as genuine.



Colchester All-Geared-Head Engine Lathe Ideal for Training Use

Colchester 12x24-in. lathe has a large-diameter spindle running on special SKF double-row roller bearings with 1-9/16-in. bore to pass the 1½-in. bar with 1½-in. collet capacity. Spindle nose, bed, and saddle are said to be extremely heavy and rigid.

Machine features 8 spindle speeds (52 to 1000 rpm) and 36 feeds (0.002 to 0.068 ipr). Swing over bed is 13 in. Gap models have 19-in. swing in gap.

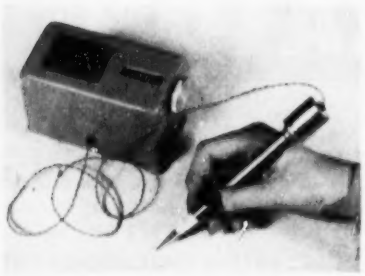
Lathe is said to be particularly ideal for training use because of its low price, ruggedness, and great number of safety features.

Shear pin device in change wheel train protects gears if carriage is run against headstock or tailstock when cutting threads. Right leg of cabinet includes drawer with three-lever lock; motor power is shut off when drawer is locked. Switch panel is automatically open-circuited when removed for repair. Machine cannot be started after power failure without resetting starting lever. Friction clutch on the feed train provides protection if the saddle or cross-slide comes into contact with projections with either feed engaged. Special guards are provided for back of machine to prevent coolant-throw. A deep tray for collection of coolant and chips is designed so that all projecting points of the machine are within tray area.

Bed is inverted-V type with elliptical cross ribbing to provide rigidity. Bearing surfaces are accurately ground. Castings are rough-machined and naturally aged before finishing; bedways chill-hardened to 200 Brinell. Spindle nose is American long taper, key-drive type. Threads are to ANC standards; electrical equipment to NEMA.

Motor is controlled by lever on front of headstock; it operates through an air brake starter. Reverse pressure on lever operates an expanding brake in pulley to stop spindle.

Imported by British Industries Corp, International Machinery Div, 164 Duane St, New York 13, NY



MARK-N-COUNT device counts each item checked. An audible click registers each count. Knob on pencil resets counter to zero — *The May Engineering Co, 6055 Lankershim Blvd, North Hollywood, Calif*

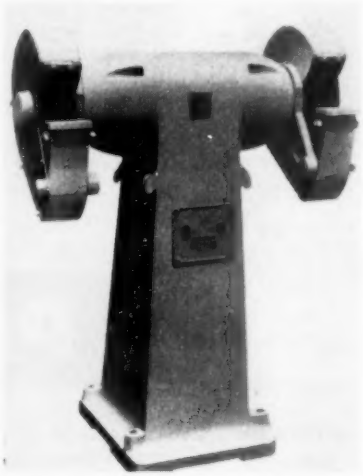
DoAll Micrometer Gage Set Checks Calibration, Squareness

Micrometer-checking set, for checking 1- and 2-in. micrometers, includes three gage blocks for 0.25, 0.65, and 1.000 in. These are used individually or in combination to check accuracy of micrometer screw at various points in its travel.

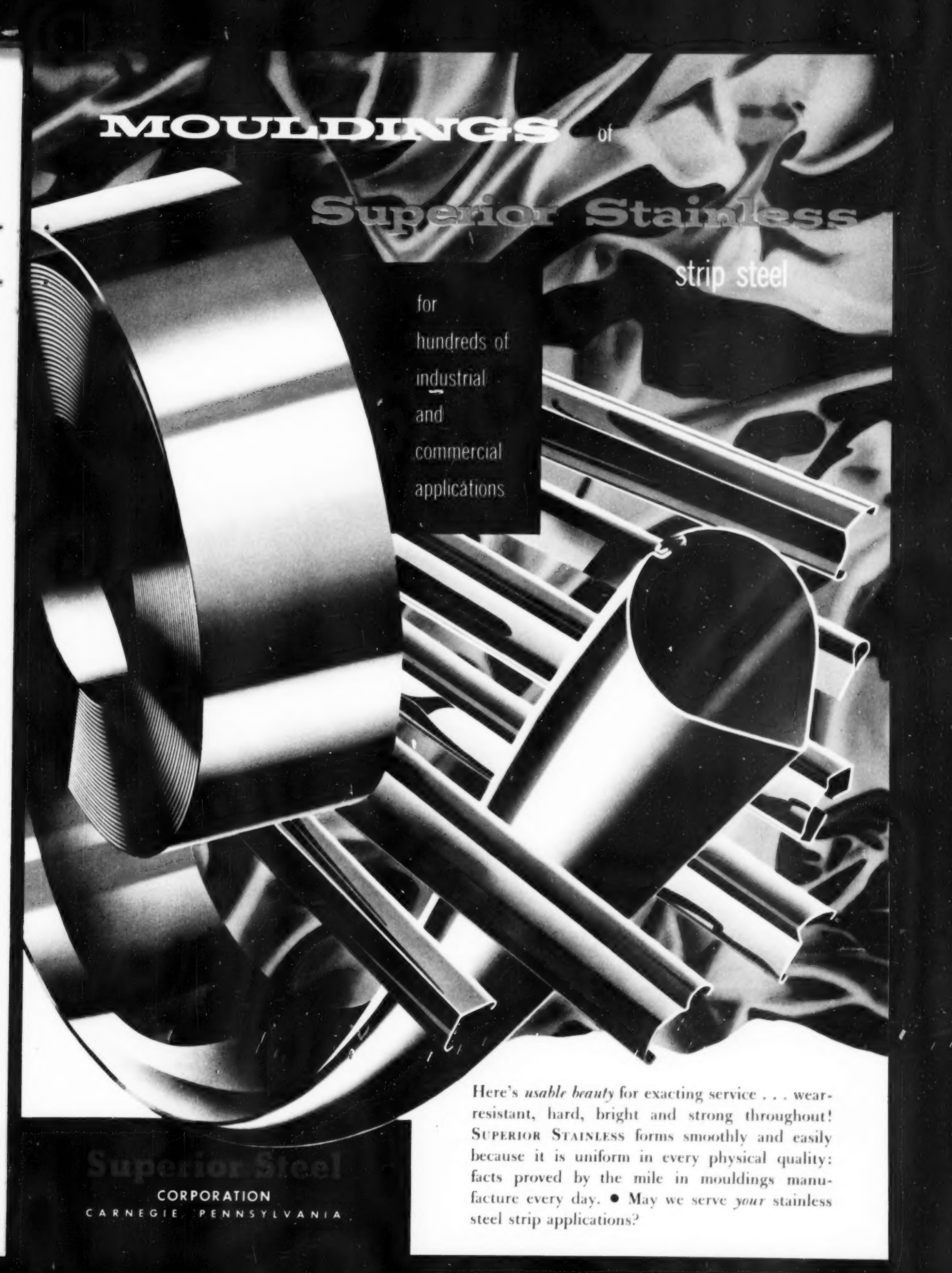
Two optical parallels of fused quartz provide accurate method of checking condition of micrometer spindle and anvil faces. A parallel is held between gaging surfaces. Under a monochromatic light, fringe lines appearing on micrometer gaging surfaces may be read to determine deviation from flatness, parallelism, or squareness. One optical parallel is 0.500 in. thick, the other 0.5125 in. This permits optical checks to be made of the spindle at two points in its rotation, 180° apart.

Components of the checking set are packed in a plastic case along with a deburring stone, jar of cleaning fluid, and jar of acid-free Petrolatum.

The DoAll Co, Des Plaines, Ill



BRITISH POLISHER AND GRINDER, manufactured by The Stamford Works, was designed to provide ample work space for two operators. Motors were designed for the machines; extra-large shafts and heavy-duty bearings are said to sustain heavy loads and provide smooth, vibrationless operation. — *Imported by Newage International, Inc, 235 E 42nd St, New York 17, NY*



Here's *usable beauty* for exacting service . . . wear-resistant, hard, bright and strong throughout! SUPERIOR STAINLESS forms smoothly and easily because it is uniform in every physical quality: facts proved by the mile in mouldings manufacture every day. • May we serve *your* stainless steel strip applications?

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No. 120 of a Series of Typical Installations

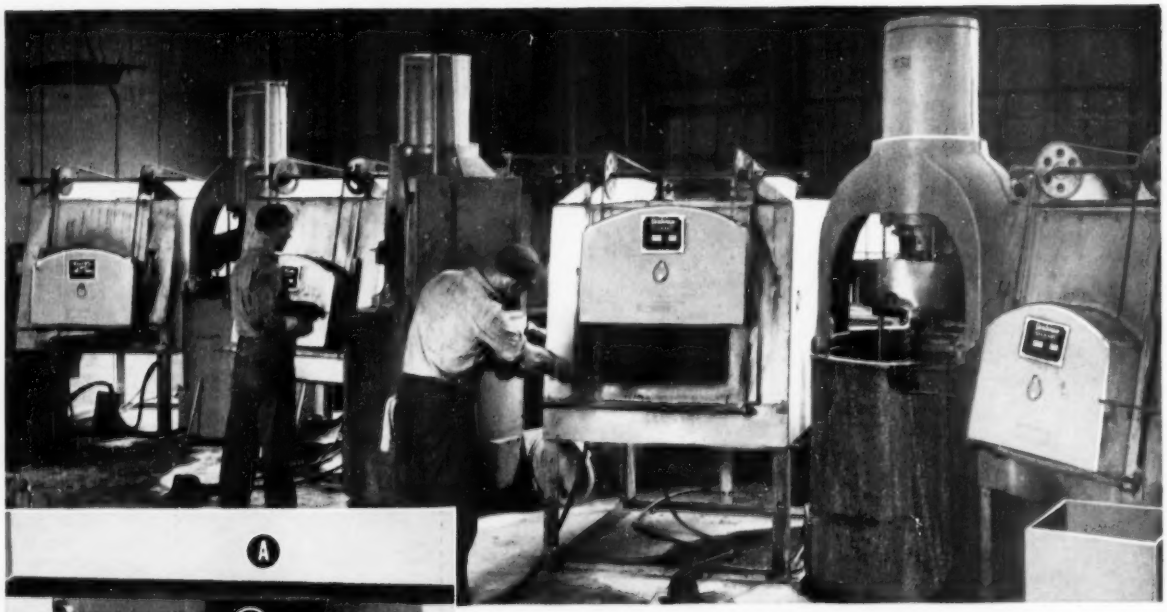
Sunbeam STEWART

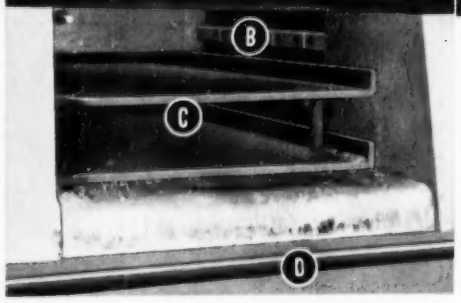
THE BEST INDUSTRIAL FURNACES MADE

HOW SUNBEAM INDUSTRIAL FURNACES MEET THE DEMANDS ON THE PRODUCTION FRONT

PRECISION HEAT TREATMENT OF CLUTCH RINGS

AT STYBERG ENGINEERING CO., Racine, Wisc.





Close-up view of double shelf hearth area. A. Patented Seal-tite door provides a positive seal that prevents infiltration of air into the heating chamber. B. Heating elements on 4 sides of chamber assures close temperature control and even heat distribution. C. Two shelves of 2812 alloy, one containing work at hardening temperature; the second, with work being brought up to temperature. D. Flame curtain decreases infiltration of air into heating chamber and ignites escaping atmosphere.

In the fabrication and heat treatment of clutch rings at Styberg Engineering, parallel tolerances on the sidewalls of rings 18" in dia. had to be maintained to within .0005. In addition, high physical properties with good impact and wear characteristics had to be obtained. Clutch rings varying in dia. from 9" to 18" O.D. with a wall thickness of .126 +.000—.004" tolerances are heat treated in five Sunbeam Stewart Electrically heated ovens. The larger rings of 18" dia. must pass through a gage slot .135" wide by 18" deep with walls parallel within .0005.

Due to extreme critical tolerances, automatic equipment could not handle the work satisfactorily. Therefore, a battery of five electrically heated Sunbeam Stewart double-shelf, atmosphere-controlled, oven-type furnaces provided the most practical heating equipment. One endothermic gas generator supplies the atmosphere to the furnaces. A non-oxidizing, non-decarburizing atmosphere allows full hardness to be obtained throughout the cross-section of the ring.

These Sunbeam Stewart furnaces are designed to provide high heat input with low wall losses. This is ideally suited for production requirements as extremely rapid recovery of the furnace to the control temperature occurs upon loading cold work. Rapid return to temperature reduces waiting time, allowing a larger, steadier production. Because of its wide operating range, this Sunbeam Stewart unit is ideal for general purpose heat treating including hardening of carbon and alloy steels, normalizing, annealing, and pre-heating high speed steels, etc.

IF YOU ARE CONSIDERING DEFENSE WORK CALL SUNBEAM. Designs are available for heat treating the following materiel:

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FORGINGS: Rotary Hearth and Pusher-type Forging Furnaces.

ARMOR PIERCING SHOT (Harden, Quench and Draw).

CARTRIDGE CASES (Anneal, Stress Relieve).

MACHINE GUN CLIPS (Harden, Quench and Draw).

JET AIRCRAFT and TANK PARTS

Sunbeam CORPORATION (Industrial Furnace Division)

Main Office: Dept. 119, 4433 W. Ogden Ave., Chicago 23—*New York Office:* 322 W. 48th St., New York 19—*Detroit Office:* 3049 E. Grand Blvd., Detroit 2

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A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM industrial furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM engineer will be glad to call and discuss your heat treating problems with you.

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MACHINES AND ATTACHMENTS

1 GRINDER—*Landis Tool Co, Waynesboro, Pa.* 24-page catalog K-53 contains illustrated information on 12x28-in. universal and tool grinder. Operating features, equipment and typical operations included, as well as accessories and specifications.

2 PRESS ROOM EQUIPMENT — *Durant Tool Supply Co, Providence 3, RI*—16-page catalog illustrates and describes roll feeds, stock reels, foot presses, choppers, straighteners, and guards. Ordering information, specifications and prices given.

3 TAPPING FIXTURE — *Industrial Sales Co, Washington, DC.* Bulletin illustrates universal fixture for use in tapping holes from 0-80 to ¼-28, or as an indicator base and mounting for inspection.

4 CYLINDRICAL GRINDER — *Van Norman Co, Springfield 7, Mass.* Bulletin illustrates and describes the 418 model for short run or production grinding of small parts. Operating advantages and specifications included.

5 LATHE—*Rivett Lathe & Grinder, Inc, Brighton 35, Boston, Mass.* 18-page catalog 1020 B provides illustrated information on model 1020 12-in. swing precision unit. Design features include back gearing for low spindle speeds, and neutral clutch to stop spindle without stopping drive.

6 BROACHING MACHINES — *American Broach & Machine Co, Ann Arbor, Mich.* 4-page circular 502 describes line of heavy-duty, horizontal, hydraulic units ranging in size from 15-ton capacity with 66-in. stroke to 60-ton with 72-in. stroke. Circulars 523 and 550 describe 2 to 10-ton capacity units.

7 TURRET LATHE—*Potter & Johnston Co, Pawtucket, RI.* 8-page bulletin 145 provides illustrated information on model 3U Speed-Flex automatic unit, for small part production, with 6-face turret design for tool flexibility. Standard and special tooling illustrated.

8 PROFILE MILLING MACHINE — *Onsrud Machine Works, Chicago 47, Ill.* 16-page illustrated bulletin 1140 describes model A-72 InvOmil for high spindle speed and high feed nonferrous metal milling. Head travels through transverse, longitudinal, and rotary feed movements.

9 INCLINABLE PRESSES — *Niagara Machine & Tool Works, Buffalo 11, NY.* 24-page bulletin 58L presents illustrated information on line of open back units with mechanical sleeve clutch. Shaft sizes from 1¼ through 4 in.; 8½ to 72 tons. Design features and detailed specifications included.

10 GRINDING MACHINES — *Matra-Werke GMBH Frankfort on Main, Germany.* 4-page folder illustrates design details of model ZA1 surface grinding machine for cylinder blocks and heads as well as any ordinary grinding job. Special features and specifications outlined. 6-page bulletin describes model KA26 crankshaft grinding unit designed for 6 headstock speeds; machines pieces up to lengths of 69 in. between centers and to 61½ in. between chucks.

TOOLS AND ACCESSORIES

11 THREAD GAGES — *Detroit Tap & Tool Co, Base Line, Mich.* 20-page bulletin SG-53 lists prices and tolerances of standard gages. Additional data includes tables listing W, X, and Y tolerances for gages up to and including 1½ in.

12 JIG AND FIXTURE TRACING TEMPLET — *Northwestern Tool & Engineering Co, Dayton 3, Ohio.* Covers 263 items in full scale on single sheet folded to measure 8½x11 in.

13 CEMENTED CARBIDE TOOLS AND BLANKS—*Carboloy Dept, General Electric Co, Detroit 32, Mich.* 20-page catalog GT-265, called "Brief-A-Log," offers condensed price list and specifications, plus buying information required.

14 CUTOFF WHEELS—*Grinding Wheel Institute, Cleveland 15, Ohio.* 19-page illustrated booklet covers usage, classification, machine and wheel speeds and mountings, techniques and handling of work.

15 SCREWDRIVING TOOLS — *Apex Machine & Tool Co, Dayton 2, Ohio.*

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60-page catalog 21 illustrates complete line with specifications and prices. Combination tools also fully described. Request on company letterhead.

16 MEASURING EQUIPMENT — *General Electric Co, Schenectady 5, NY.* Revised 64-page catalog GEC-1016A contains illustrated data on 115 testing and measuring devices. Applications, characteristics tables, and prices included.

17 GAGE BLOCKS — *Hommel Werke, Mannheim, Germany.* Bulletin presents illustrated information on blocks in lengths up to 120 in., and combinations up to 480 in. Data sheets available on parallel blocks with round cross-section, and adjustable parallels for measuring bores and tolerances.

18 LUBRICATION—*Farval Corp, Cleveland 4, Ohio.* 20-page illustrated bulletin 26 describes centralized systems. Variety of applications pictured, and features of Multival and automatic types enumerated.

19 PORTABLE POWER TOOLS—*Syntron Co, Homer City, Pa.* 29-page catalog 537 illustrates descriptive information on complete line including new electric impact wrench.

HEAT-TREATING AND WELDING

20 RESISTANCE WELDING — *Resistance Welder Manufacturers Association, Philadelphia 3, Pa.* Bulletin 17 is a complete bibliography of published technical articles on all phases during past few years. Price, $1.25.

21 HARD-FACING—*Mir-O-Col Alloy Co, Los Angeles 31, Calif.* 52-page illustrated brochure presents comprehensive study of process, applications, recommendations of specific rods for a thousand individual pieces of equipment subject to impact and abrasion.

22 HARD-SURFACING—*Lincoln Electric Co, Cleveland 17, Ohio.* 26-page Weldirectory 466 contains general discussion, tabled guides, illustrated applications, and section on fluxes.

PLANT-SERVICE EQUIPMENT

23 MATERIALS HANDLING—*Barrett-Cravens Co, Chicago 9, Ill.* 100-page eleventh edition of pocketsize Junior Catalog 535 illustrates information on comprehensive line for floor level handling.

24 PLANT LAYOUT—*F Ward Harman Associates, Halesite, LI, NY.* 31-page catalog on 2- and 3-dimensional layout equipment with TemPrint process. Data, case histories, layout photos included.

25 NOISE MEASUREMENT — *General Radio Co, Cambridge 39, Mass.* 120-page Handbook thoroughly covers measurement of airborne sounds, including definitions, standards, equipment, procedures, interpretation of results. Price, $1.00.

26 INDUSTRIAL COMBUSTION DATA —*Hauck Mfg Co, Tenth St, Brooklyn 15, NY.* 168-page illustrated handbook on heat processing applications.

27 VACUUM IMPREGNATION — *F J Stokes Machine Co, Philadelphia 20, Pa.* 24-page illustrated catalog 760 describes range of applications for process by which voids in porous materials are filled with impregnant after air and moisture evacuation.

28 AIR HANDLING UNITS—*Westinghouse Sturtevant Div, Hyde Park, Boston 86, Mass.* 6-page bulletin 600 describes line of units for heating, ventilating, and air conditioning. Installation recommendations and accessories included.

29 CORROSION - RESISTANT CEMENTS—*Pennsalt Chemicals, Philadelphia 7, Pa.* Comprehensive chart shows resistance of seven classes of cements to 297 most generally used corrosive chemicals.

PARTS AND MATERIALS

30 GAGES—*Minneapolis-Honeywell Regulator Co, Philadelphia 44, Pa.* 32-page catalog 7001 describes types of pressure and vacuum units used to measure vacuums as great as 10-11 mm of mercury and pressures as high as 150,000 psi. Data presented in tabular form.

31 V-BELTS—*Durkee-Atwood Co, Minneapolis 13, Minn.* 60-page engineering catalog on applications includes data on new increased hp ratings. Section and tables on revised pre-engineered drive tables for quick calculation.

32 ELECTRICAL FITTINGS—*Buchanan Electrical Products Corp, Hillside, NJ.* 16-page illustrated catalog 53 describes complete line of solderless wire connectors and specialized fittings. Includes specifications, dimensional data, applications, ordering information.

33 BERYLLIUM — *Beryllium Corp, Reading, Pa.* 20-page Beryleo Product Directory describes products, including the pure metal, oxide, and alloys.

34 SPROCKETS AND ROLLER CHAIN —*Dodge Mfg Corp, Mishawaka, Ind.* 24-page illustrated bulletin A-624 offers detailed information on line. Bushings and extractors covered. Dimensional data and prices included.

35 GRAPHITAR PARTS—*US Graphite Co, Div, Wickes Co, Saginaw, Mich.* 66-page catalog offers illustrated information on material for seals, bearings, end plates, valves, piston liners, and many other parts. Characteristics and physical properties covered.

36 COPPER AND COPPER ALLOYS— *American Brass Co, Waterbury 20, Conn.* 28-page booklet B-36R explains chemical and physical nature of corrosive attack in various forms. Tabulation indicates resistance of principal types in contact with 183 different agents, including atmospheric.

37 TITANIUM — *Mallory-Sharon Titanium Corp, Niles, Ohio.* 7-page booklet contains data on preliminary machining recommendations, tools, tool angles, cutting speeds and fluids, and various machining operations.

MISCELLANEOUS

38 GERMAN INDUSTRIES—*Industrie- und Handelsverlag, Hannover.* Second edition of catalog on export houses of Lower Saxony. Comprehensive survey covers extensive variety including large section on machine tools.

39 ELECTROFORMING — *Bone Engrg Corp, Glendale 4, Calif.* 6-page booklet gives informative data on advantages, applications, and facilities.

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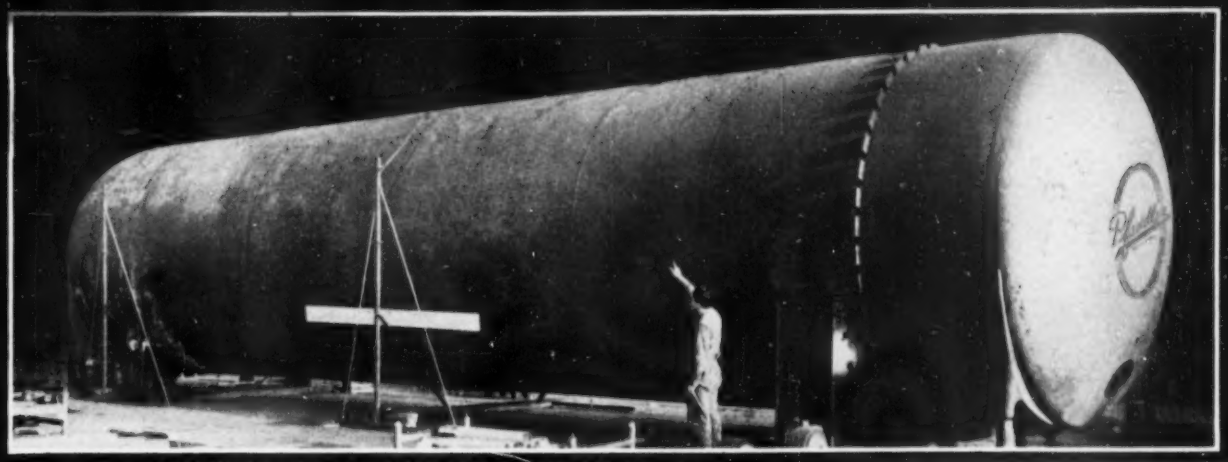
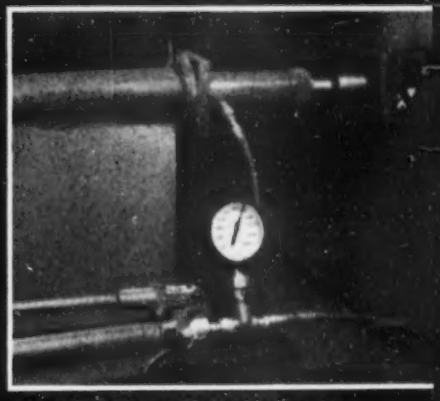


Welded, glassed steel tank 12' x 54'; capacity 1426 barrels.

Radiography helps protect the quality in 1,000,000 GLASSES OF BREW



Sound welds enable tank's legs to withstand 30,000 p.s.i. thrust test.

THIS GIANT glassed steel tank will store beer to fill one million glasses . . . store it safely and protect its quality in storage.

Thanks to radiography, its seams are sound, expertly welded to accept a lasting bond between steel and glass liner.

Thanks to radiography, its welded legs are sturdy—tested to withstand 30,000 p.s.i. That's 70% in excess of the code requirements in far western earthquake areas.

All this points up two important ways that radiography helps extend the use of welding: It helps to check and to develop welding skills and technics; it proves welds sound.

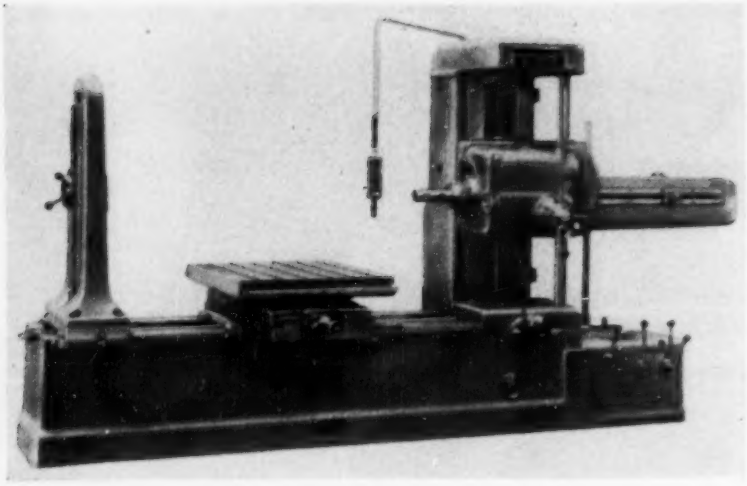
Radiography can help you get more business—build a reputation for high quality work. If you would like to know how, talk it over with your x-ray dealer.

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography . . .

another important function of photography

Kodak
TRADE-MARK



German Horizontal Boring Mill Has 29½-, 35-, 43-in. Vertical Capacity

Wotan 3-in. horizontal boring mill, supplied with 29½-, 35-, or 43-in. vertical capacity, is said to be equally suited for toolroom or production use. Mill is equipped with power rapid traverse in all directions.

Tabletop, 31x39 in., swivels 360° and machine is capable of 18 spindle speeds ranging from 17 to 910 rpm; 18 feeds range from 0.001 to 0.500 ipr. Longitudinal feed and cross-feed can be read to 0.001 in.

Nitrided 3-in. spindle is hardened and ground throughout; also available in Morse taper No. 5. Face of spindle sleeve conforms to No. 50 US standard for direct mounting of cutter heads.

Standard machine has max distance from tabletop to spindle center of 29½ in.

Hardened and ground gears mounted on multiple spline shafts and extensive use of roller and ball bearings are said to insure long life. Hardened and ground helical main-drive gear is located immediately behind front bearing of spindle sleeve to prevent vibration. Spindle sleeve is mounted in adjustable precision roller bearings to prevent undue rise of bearing temperature during continuous operation at high speeds. The 10-hp motor is equipped with electric brake.

Imported by Parker Machine Co, Inc, 158 Pioneer St, Brooklyn 31, NY

Tungsten Carbide Dies Made From Pre-Sintered Carbide Blanks

Tungsten carbide dies can reportedly be repaired, altered, or produced from blanks of pre-sintered carbide by using the Nord Di-Profiler. Stroke may be adjusted from zero to 0.25 in. and operation is said to be vibrationless even at the long stroke. Features include four separate SKF precision bearings and high-precision eccentric balancing construction.

For working carbide dies, a variety of diamond files are available in addition to complete line of burs. Special holding fixtures and stones with a wide range of abrasive qualities are also available.

Work stages for making the triangular shaped drawing die shown above are: (1) Hole is made in pre-sintered carbide die blank by rotary diamond grinding tool and given triangular shape with diamond files. (2) Final sintering. (3) Die is brought to near-size with diamond files. (4) Cast iron lap with diamond compound (Coarse, Medium, Fine). (5) Fiber lap with diamond compound (Extra-Fine).

Nord International Corp, Denville, NJ

Proto Socket Wrenches Include Hollow-Head-Screw, Metric-Size

Hollow-head-screw and metric-size socket wrenches have been added to the Proto line. Ten ⅜-in. drive sockets are available ranging from hexagon-bit size of ⅛ to ⅜ in. and accommodating Allen-type screws from ¼ to ¾ in. Three sockets have extra-long bits for special jobs. Each bit is held securely by a slotted-head setscrew.

Sockets with metric-size openings are needed for many foreign-built machines. Line includes nine ¼-in. drive sockets with openings from 4 to 12 mm and twenty ½-in. drive sockets with openings from 12 to 32 mm.

All sockets are made from special alloy steel and chrome plated.

Plomb Tool Co, Los Angeles, Calif

Steam Cleaning Machine Discharges 150 gph

Model LH Clayton-Kerrick steam cleaner is capable of discharging 150 gal. of balanced cleaning solution per hr and is said to be priced low. Unit offers graduated range of cleaning pressures from 30 to 100 psi. Thermal efficiency of at least 75% is claimed for the helical-wound heating coil.

From cold start, full pressure is attained in two minutes. Wide variety of models includes oil- or gas-fired, electrical or gasoline engine driven, and portable, stationary, or trailer type. Each can be equipped with remote nozzle control.

Features include: fuel pump designed for fast priming; soap pump eliminating possibility of airlock; inverted pressure atomizing burner; coil built for cleaning without dismantling; and sealed bearings on the water pump.

Automatic overheating protection is provided by thermostat controls which cut off fuel supply to burner in event of excessive pressure or temperature.

Clayton Manufacturing Co, Box 550, El Monte, Calif

Miller — HIGH PRESSURE

HYDRAULIC CYLINDERS

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly

WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

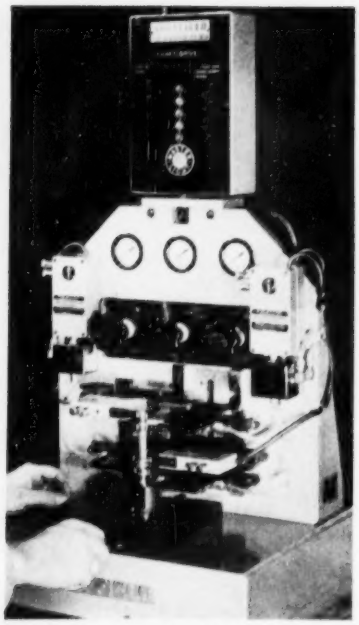
CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

Miller

MILLER MOTOR COMPANY

2004 N. HAWTHORNE AVE., MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

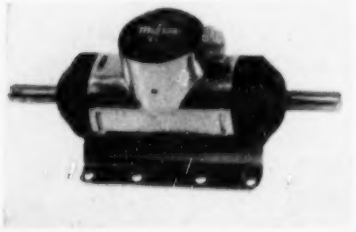


Multiple Gage Checks Five Bearing Diameters

Multichek gage simultaneously inspects five bearing diameters on a drive shaft and indicates by means of lights whether or not dimensions are within tolerance. Three Airlectric gage heads check dimensions to "tenths" and two Electrichek heads check to thousandths of an inch. Shafts can reportedly be inspected at the rate of 600 to 800 per hr at 100% efficiency. Minimum and maximum masters are used for the setup.

Operator places part in fixture and slides fixture forward into gaging position. If all dimensions are within tolerance, master light remains white and signal lights black out. If one or more dimensions are out of tolerance, master light turns red and individual signal lights turn red or green to indicate undersize or oversize.

The Sheffield Corp, Dayton 1, Ohio



Geared Controls Vary Speed Of Metron Miniature Units

Metron series 3 variable speed changers are available with three types of geared controls. Output shaft speed can be infinitely varied from 1/5 to 5 times input speed by rotating control shaft with spur-, miter-, or worm-geared remote controls. Units weigh only six ounces and are said to be ideal for such applications as recorders, flow controls, regulators, and scanning mechanisms.

Metron Instrument Co, 432 Lincoln St, Denver 3, Colo

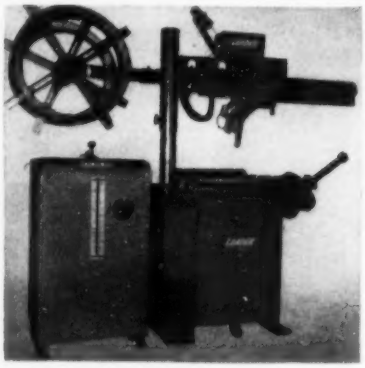
Fork Truck-Trailer System Uses Automatic Couplers

Market Forge has developed an integrated fork truck-tractor-trailer system using medium-duty automatic couplers. System is derived from modified standard items.

Fork truck or miniature tractor may be used to haul the load. Trailers are modified 30x60-in. load carrier units with standard superstructures and automatic couplers.

If pallets are used, the fork truck, after loading the trailers, can haul as much as twenty times the number of pallets in one trip.

Market Forge Co, Everett 49, Mass



New Features Added To Leader Welding Machine

Model 550 Leader automatic welding machine has had four features added to its design: automatic, self-adjusting, high-frequency arc starter and stabilizer device has no moving parts and permits the use of low-density current; reversible variable-speed-drive control for work-handling motor; Acme-thread-powered horizontal-arm lift for quick arc-positioning; sight-feed flux hopper and adjustable, two-piece, caster-mounted flux bin.

Still standard equipment are such features as: stepover control for positive manual operation; 4-in. transverse adjustment that permits exact positioning of electrode wire in relation to work centerline for all work diameters; and double reels for handling all types of wire.

Leader Welding & Mfg Co, 2418 Sixth St, Berkeley 2, Calif

DC Rectifier Welder Added to Sureweld Line

Welder has 3-phase transformer supplying power to full-wave selenium oxide rectifier. Integral with transformer is reactor circuit with saturable core. Variable rheostat varies current saturating core and thus output of welder. Short-circuit current is high. Output current has pronounced ac ripple tending to reduce arc blow. Voltage recovery is reportedly almost instantaneous when arc is momentarily shorted.

Cooling air, directed by baffles, is drawn in two paths through rectifier stack and transformer. Temperatures are kept below 90 F rise permitted for Class B insulating materials. Thermostat on rectifier stack checks any abnormal heating.

Welder is available with ratings of 100, 200, 300, 400, and 600 amp.

National Cylinder Gas Co, 840 N Michigan Ave, Chicago 11, Ill

SEVEN STYLES OF END MILLS have been added to the Goddard & Goddard line, including long, extra-long and small-diameter. Total of 149 stock end mills are now available with diameters from 1/16 to 2 in. Design features high helix and curved undercut on tooth faces — *Goddard & Goddard Co, Detroit, Mich*

TOP MAN ON THE A.C. CONTROL TOTEM POLE?

THAT'S CLARK TYPE "CY"!

TOP IN **EFFICIENT DESIGN**

TOP IN **THOROUGH ENGINEERING**

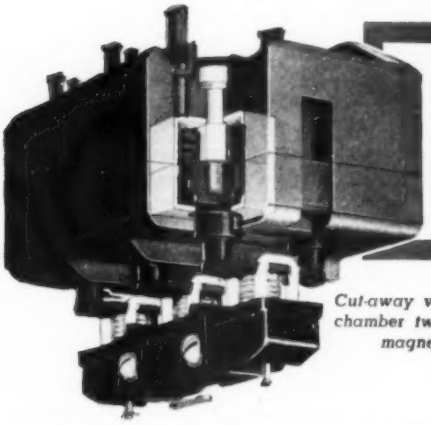
TOP IN **EXPERT MANUFACTURE**

TOP IN **RELIABLE PERFORMANCE**

TOP IN **EASY INSPECTION**

TOP IN **LOW MAINTENANCE**

TOP IN **EVERYTHING NECESSARY TO PROVIDE STURDY RELIABLE DEPENDABLE A.C. STARTERS FOR HEAVY DUTY APPLICATIONS.**



Let's Look at the Design

Cut-away view showing steel arc chamber twin-break contacts and magnetic blowout coils.

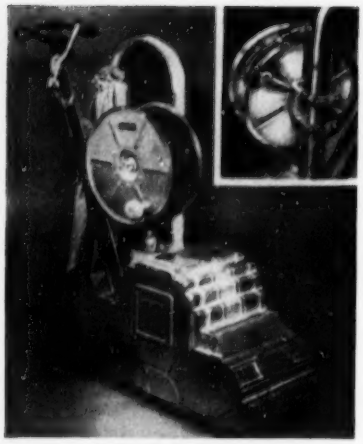
Here, for the first time in electrical control history, twin break contacts and strong multi-turn twin magnetic blowouts are combined in economical space.

- **Each arc chamber is steel enclosed, carries the flux, and provides the ultimate in non-carbonizing.**
- **The arc is forced to rotate, moving continually from a hot to a relatively cool spot.**
- **This results in highly efficient and extremely effective arc interruption.**
- **Consequently, contact life is greatly increased.**
- **All parts are front connected, front removable.**
- **Only tools needed are wrench and screwdriver.**

You'd better try **CLARK TYPE "CY"**

THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152ND STREET, CLEVELAND 10, OHIO

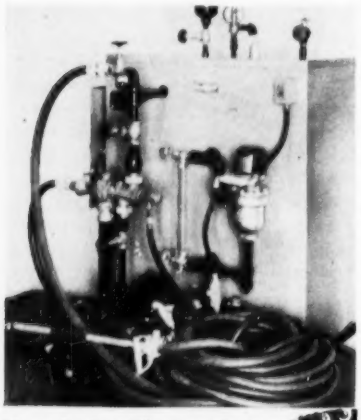


Electric-Cord Reel For Portable Power Units

Port-O-Reel is equipped with a mounting bracket for attachment of the reel to the frame, chassis, or handle of portable power equipment. Reel has built-in, dust-tight collector ring permitting continuous flow of current as reel is turned. Free-turning knob provides for winding and reel is equipped with adjustable brake and lock.

Unit is designed for all types of portable power equipment using up to No. 12, 3-conductor cord. Reel weight is 5 lb.

Industrial Electrical Works, Room B336, 1503 Chicago St, Omaha 2, Neb



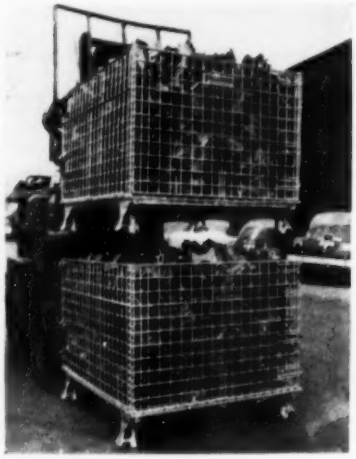
Electric Jet Cleaner Features High Pressure and Temperature

Equipment features both Speedylectric steam-jet and Sellers injector hydraulic jet. Identified as Speedylectric Hydrosteam, unit is available in both stationary and portable models. Source of steam is Speedylectric steam generator, reportedly free from flames and smoke, self-regulating, 98½% efficient, silent, and compact.

Sellers unit provides solid jet of superheated water and detergent propelled under high discharge pressure and temperature. For delicate parts of machines that must be protected from excess moisture, steam-jet provides pin-point cleaning under fingertip control of operator; can also be effectively used, according to maker, for applying concentrated, undiluted solvents, detergents, or stripping agents.

As sparks, flames, and other fire hazards are eliminated, cleaner is said to be especially adapted to such industries as oil refineries, paint works, aand chemical plants.

Livingstone Engineering Co, 100 Groove St, Worcester 5, Mass



New Models in Palletainer Handling-Unit Line

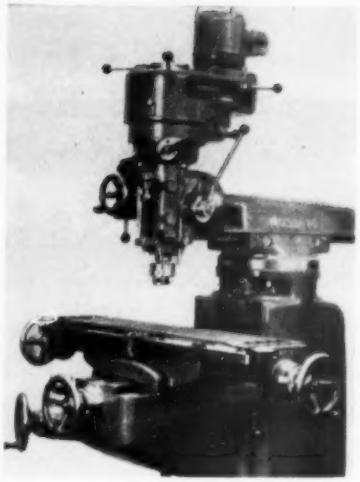
Hi-Lode handling unit provides extra capacity for bulky materials through elimination from the under carriage of center legs and leg braces. Loads can now be piled above the top rod. Like other Palletainer units, Hi-Lode features electro-welded, reinforced, steel-rod construction with eight-way entry for fork trucks.

Hi-Lode folds to 1/5 space when empty. Unit is available with capacities of 2000, 4000, and 6000 lb.

Union Steel Products Co, Albion, Mich

Series F200 and F300 face shields have been redesigned by American Optical to provide ⅝ in. more clearance between wearer's face and window. Floating snap fasteners permit window to expand under extreme heat without cracking or curling. Various types of windows, replaceable and interchangeable, are available in clear or green acetate in three sizes and thicknesses.

American Optical Co, Southbridge, Mass



Italian Vertical Miller Features Eight-Speed Head

Vertical milling machine, Model VO, has eight-speed head and table working surface of 8x40 in. Machine has 1-hp head with spindle of nickel-chrome steel provided with No. 9 B&S taper or No. 30 standard taper. Head can revolve 360° on its horizontal axis and may be tilted 180° from its vertical axis. Power feed to quill, up or down, is automatic.

The 0.001-in.-graduation dials are 4 in. in dia. Longitudinal travel is 26 in., cross travel 10 in., and vertical movement of the knee 20 in. Max distance from column to centerline of spindle is 18 in.

Available accessories include coolant pump, longitudinal table feed, trays, dial indicators and end-measuring rods for jig boring, offset boringhead, swivel-base vise, and collet attachment for the spindle.

Imported by Amitool Company, Sylvester St, Westbury, NY

Magnet Tools Reach Inaccessible Spots

Magnet tools are used to remove metal chips and other objects from inaccessible spots. Tools come in a variety of sizes, some with adjustable shafts, some with flexible shafts. All probes have Carboloy alnico magnet heads.

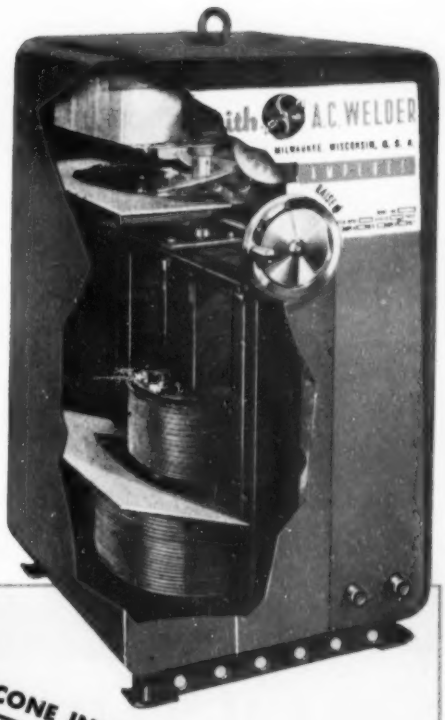
Long probe has removable core so it can be worked into tight spots. Medium probe has swivel head. Pocket probe is used for more easily reached spots.

Snap-On Tools Corp, Kenosha, Wis

The A. O. Smith *Champion* Heavy-Duty A. C. Welder

6000 hours longer life

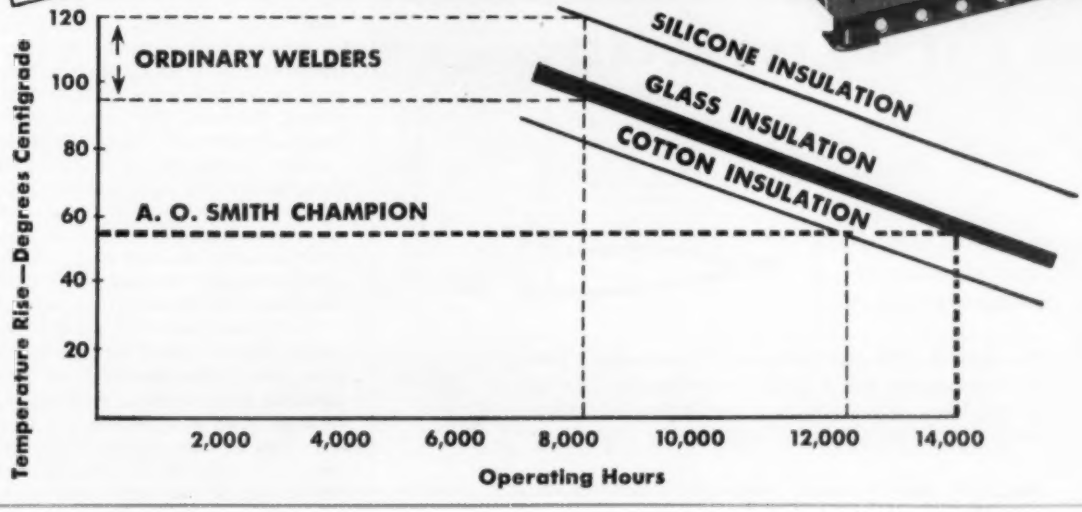
than any other A. C. welder



Available in 300-, 400-, and 500-Amp. models.

PROOF

LIFE EXPECTANCY CHART



Temperature Rise Determines Machine Life

According to the Insulation and Aging versus Temperature Curves, as published by the A.I.E.E. . . . *the cooler a welding machine operates, the longer its production life.*

The A. O. Smith Champion is the *only* A. C. welder on the market with enough copper and cooling capacity to operate without exceeding a 55° C. temperature rise—as compared to the 90° C. rise allowed by N.E.M.A. for glass-insulated welders.

This means: The Champion will give you top production efficiency almost twice as long as any other A. C. welder on the market today.

Built for those who want the best in welding, the Champion has a full 75 open circuit volts, high-velocity down-draft ventilation, all-weather case, 12½ KVA power factor correction and stepless current control.

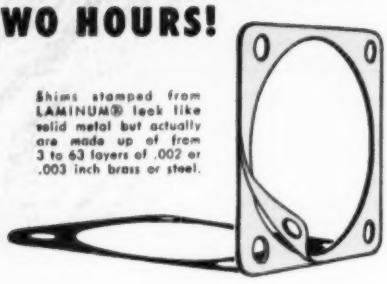
For additional information on welding machines, electrodes and accessories, see your local A. O. Smith distributor or write to A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wisconsin.

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION
Dept. AM-853, Milwaukee 1, Wisconsin
INTERNATIONAL DIVISION: MILWAUKEE 1
Made by welders . . . for welders

2 Seconds

CAN SAVE YOU TWO HOURS!



Shims stamped from LAMINUM® look like solid metal but actually are made up of from 3 to 63 layers of .002 or .003 inch brass or steel.

Adjusting bevel gear mesh with a laminated shim is a matter of two seconds to remove a lamination!

The shim in this case is made of LAMINUM®, our exclusive material. It is a "solid" unit built up of 16 layers of .002 brass. It peels quickly and easily. Each shim removed adjusts the bevel gear position by two thousandths.

You save time by easier machining tolerances on the housing; ***you save time*** by eliminating pesky assembly machining; ***you save*** by not tying up a machine intermittently. IT'S EASIER!

SEND FOR LITERATURE

LAMINATED SHIM COMPANY, INC.

SHIM HEADQUARTERS SINCE 1913

Check Our Stampings Division For Your Stamped Parts Requirements

3108 UNION STREET • GLENBROOK, CONNECTICUT

ROUND TABLE Discussion

TRUE CONFESSIONS

Should the executive always act as if he's right—and knows the answers? Can he afford to let somebody prove him wrong? Is his "feet of clay" or his cracked pedestal a sign of weakness—or of strength? Say some readers . . .

ANY MAN WHO thinks he knows it all knows nothing. If a man is getting so big-headed that he can't have anyone tell him anything when he does a job, he should not hold the responsible position of supervisor. Ed's worrying that the news will spread that he can't handle his job shows that he can't handle it.

In most professions these days they hold conventions in which all the best men get together with their ideas and activities for criticism and exchange. In many industrial organizations the top men get together every so often to discuss the problems of their industry; some have the foremen sitting in to give their view. Those industries are on top in production, because everyone knows what is going on. If some snag develops, there is help from others, because the policy is to bring in others when help is needed.

Every man is a peg in the wheel of industry, and some acquire more knowledge than others. Some men may have worked in other places that had the same trouble that you are up against now, Ed, and might know what they did there to remedy it.

It reminds me of a time I was called into a plant manufacturing steel boxes. The drawing die they used had been working properly until they received a shipment of steel, and then trouble started. They cut the sheet steel to the proper size, but in use, it tore nine out of ten times. They tried different lubrication but it didn't help. After listening to the story, I took out the die and punch, and with a magnifying glass, noticed that the edges of the die were frayed. I took the punch and die and smocthed the edges and then hard-chrome-plated both; it did the job. How did I know it was the proper thing to do? Because we had once had a job like that, and someone suggested chrome-plating; it taught me something I didn't know before.

In a place where I used to work when I had a new man coming to

work for me in my department I used to say to him when he came to report that I wouldn't have any man working *for* me, but *with* me. It makes a big difference; when a man works for you he will do only so much and no more, but if you have men working with you, they operate as a team. Each one knows that the other depends on him to do his share, and that he can depend on them. On any new job, I'd take the men who would be working on it and together we'd figure it out beforehand. If any trouble developed later, we pooled our experience, and usually among us we found the answer to remedy it.

No, Ed, you will not lose face if you ask for help. In fact, the men will think more of you. Any human being likes the man who admits he is wrong, or doesn't know.

Michael Axler
Los Angeles, Calif

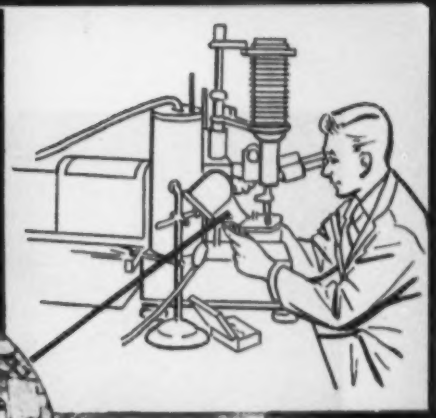
POOR ED'S PLIGHT is dire indeed. Almost, but not quite, heartbreaking. After strutting about for years as though he were a real peacock, proud of his tail, and with a chest that could have done credit to a pouter pigeon, it appears that he is not such a big fellow after all. Not even a real peacock; just a jackdaw aping a peacock.

And now his bluff is being called. If one of those poor tools on whose backs he has been riding for years, picking their brains at the same time without thanks or acknowledgement, comes not to his rescue, his unmasking will be complete. Poor little, very little Ed.

And yet it may be that most of his fears are but figments of his own imagination, the result of the worm's eye view of men and things.

What is a foreman? There would seem to be various shades of meaning to the prefix "fore." It implies

WHAT'S IN IT...



FOR YOU?

Our view of Kennametal discloses a sound, uniform physical structure that gives promise of consistently good mechanical properties. These are static until put to use on the job—translated into machining advantages for you.

We put more of the best into Kennametal so you may get more of the best out of it.

What is in it for you? Uniform hardness, unusually high strength, great durability. What do you get out of it? Consistent tool performance, long life. These are reflected in time savings on the job, better use of machines, less grinding expense, lower production costs.

Can we prove it? Yes— there are scores of outstanding Performance Reports on a wide variety of Kennametal applications. These are yours for the asking, or we shall be glad to demonstrate by cooperating on any tooling problem in your plant. Our Field Engineers will be glad to help you. Kennametal Inc., Latrobe, Pa.

KENNAMETAL
CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY

ANOTHER EXAMPLE OF

KELLER Air Tools
engineered to industry

Some of the toughest jobs in industry suddenly become easy when Keller Ratchet Wrenches go to work. They are the *only* successful power ratchet wrenches ever devised (air OR electric), and they have eliminated some very tiresome jobs.

For instance, on the automobile assembly line shown above, where a Keller Ratchet Wrench is used for attaching the accelerator pedal.

KELLER *Air Tools*

for tightening hard-to-reach nuts

Open-end design fits over hydraulic tubing and piping

Can be used with built-in or detachable sockets

Simple operating mechanism

Reduces operator fatigue

Light weight and balance

Reaches into close quarters

Facts in Brief

about Keller Ratchet Wrenches

Send for literature and additional information on this unique POWER ratchet wrench

Keller Tool Company, Grand Haven, Mich.
Please send me additional information and specifications on the Keller Ratchet Wrench.

Name_____ Title_____

Company_____

Address_____

City_____ Zone___ State_____

the one in front, a leader, seeing and foreseeing, one who can direct. In the light of such a definition, is Ed a foreman in fact, or does he only sit in the foreman's chair, cracking his whip if and when he dares.

There are many Eds; I met one such when barely out of my teens. I had had the audacity to go from a village in the back of beyond to the great London. I started on a night shift, was put to work on a medium size chuck lathe, and given a large bushing to turn and drive home. This was nearly ready for fitting when Ed's bewhiskered grandad came and asked what I was doing, tried the calipers, told me he feared it was too small, and spoiled. I was to take it out and try it in place. With the humility of Uriah Heep and the rage of Hiawatha ("like a living coal his heart was") I tried the bushing in and found it was too large. I had been told to drive it home, and it took a very long time. Threatened with the sack if it were small, and also if I split the main casting because the bush was too large, what was a poor yokel to do? That foreman must have been Ed's grandad in direct line.

One might reasonably wonder if it be even faintly realized what a tremendous price industry pays for its Eds and their incapacity.

P E James
Lincoln, England

THERE IS an old proverb: "Open confession is good for the soul." There is no reason why this admirable counsel should not be heeded by foremen as well as the rank-and-file workers.

Why is the foreman fearful that his confession of lack of knowledge of one particular problem will be interpreted by his men as indicative of general inefficiency? He should realize:

"Strange how much you've got to know
Before you know how little you know."

The job of being a foreman does not

"There! . . . now let's hear you say my new design won't fly."

ASK

BAIRD

ABOUT IT!

HIGH PRODUCTION TOOLING

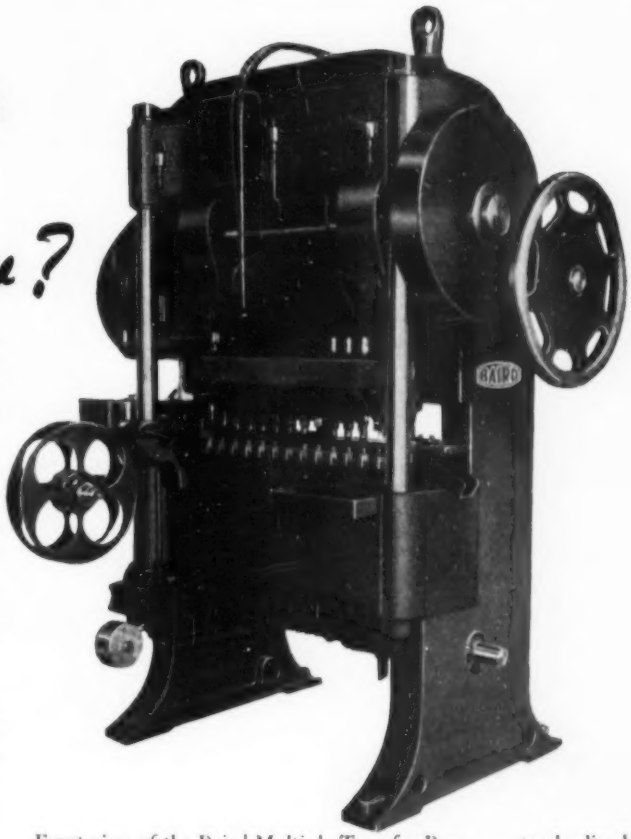
Biting off *More* than you can *Chew?*

Many types of small stamping machines can bite off coiled metal stock, but the BAIRD MULTIPLE TRANSFER PRESS cleverly chews each length into accurately formed products at the rate of thousands of pieces per hour.

Almost-human transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, etc., complete the piece.

Simply stated, the Transfer Press combines, in a single cycle, operations that otherwise might require several smaller machines with an operator for each. There are almost endless tooling possibilities . . . set-ups that turn out millions of small parts at extremely low cost.

An installation of Baird Multiple Transfer Presses puts the buyer in a most favorable competitive position in a buyer's market. Better "ask Baird about it!"



Front view of the Baird Multiple Transfer Press . . . standardized in 12 sizes with rated working pressures from 5 to 55 tons. Coiled stock from 2½" to 4" in width is automatically fed at high speeds.

SEND FOR TRANSFER PRESS BULLETIN

the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

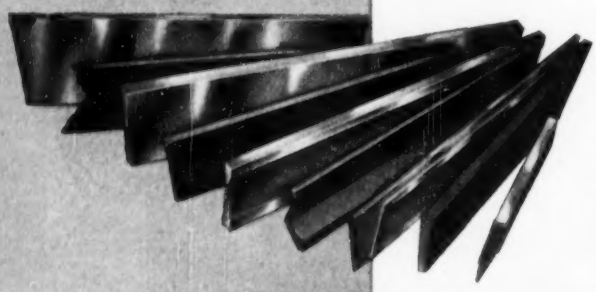
AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

6BA53

CUTTING-OFF BLADES

JCO CUTTING-OFF BLADES and HOLDERS

T-CUT BLADES



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necessarily carry with it the requirement of infallibility. A foreman cannot always be right; he cannot always be expected to have the answer to every problem that arises in the course of a day's work.

It has been my experience that seeking the advice of veteran employees casts no reflection on the foreman who attempts this action. On the contrary, it benefits both foreman and worker. It often happens that a man of limited experience is appointed supervisor over workers or other supervisors who possess considerably more knowledge of the details of the work than he does. There are usually two reasons for this. One is that in selecting a supervisor for a long pull, and one who in time is expected to rise still higher, the qualities of integrity, intelligence, and other attributes of leadership may outweigh the lack of experience on the part of the prospective supervisor. It is felt that if these qualities are sufficiently marked, the technical experience will come in time. In filling the higher positions, this line of reasoning especially holds true. The second reason for this condition is that in some plants and even in some departments a variety of trades is represented. The new supervisor may have risen up through one of these trades and it stands to reason that he is not in a position to be as familiar with all of them as he is with his own.

Inquiring about what one does not know is a sign of strength, not weakness. In my opinion, anybody, even a foreman, can afford a few stumps. Of course the question may arise in some minds as to how a supervisor can maintain his prestige when called upon to make a decision or have an answer ready about a matter that he does not fully understand. The answer is to put forth the neces-

"We're going to safety-ize this machine . . . been too many accidents."

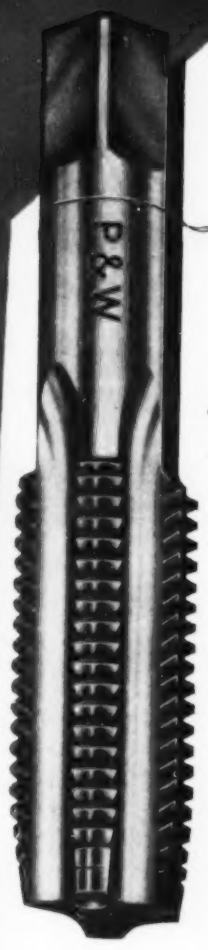
sary time and effort to render an intelligent decision; even to the point of gathering information from the workers in the foreman's own squad who may be able to help him to arrive at a correct answer.

The foreman should never try to bluff it through. The experienced workers quickly sense how much the supervisor knows and they cannot be fooled. If they find that he will not be content until he has gone to the bottom of things, they will attach little importance to his lack of experience or pertinent knowledge about a particular problem. The foreman's intelligence and integrity come to his rescue in admitting he does not know all the answers. But if he tries to pass himself off as something that he is not, the men will take delight in showing him up.

In the case under discussion, the foreman should admit he is stumped, and ask some of his experienced men for their opinions in rectifying the jamming of the press tool. He should not be afraid to admit to his subordinates that he does not know the answer to one problem, nor fear that because of his inability to come up with an answer it will lower him in the eyes of his men. His position as foreman will not be damaged by letting out the alleged secret that he is not the infallible oracle that he was cracked up to be. The foreman should remember that some of his men may be on to his secret. It's not the worst thing in the world to admit that you are stumped for an answer once in a while. It will be an opportunity to further good worker relation and closer cooperation between foreman and worker.

Going to the men for solution of a problem may be admitting defeat for the foreman. What is defeat? Nothing but education, nothing but the first step to something better. Defeat should never be a source of discouragement, but rather a fresh stimulus. The good that will come out of the foreman's admission of defeat will not only help in getting a ticklish problem solved, but the workers will probably work better for a man who has proven that he is a human being, not an aloof and disinterested supervisor. Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it.

There is no substitute for experience. A worker experienced in an occupation which he has followed for many years usually has many special capabilities over and above the general requirements of his job. Usually he has acquired those attributes of mature experience such as de-



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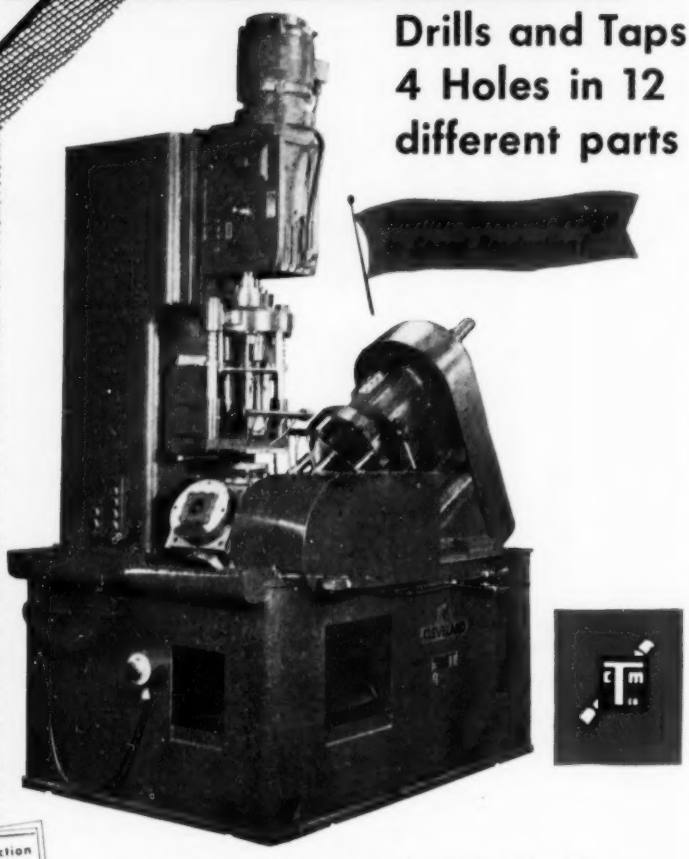

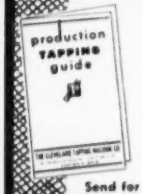

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The power driven 6 station drum index unit of this new Cleveland machine is designed to accomodate 12 different parts. No clamping is required—the parts automatically drop off into a chute. The 4 spindle multiple head is adjustable. Estimated production at 100% efficiency is 343 pieces per hour.

With the precision lead screw feed more perfect pieces per hour are possible on Cleveland machines. By combining several operations in one machine and tapping groups of holes at one stroke Cleveland engineers are able to realize greater speed with proportionately lower operating costs.

It will pay you to put your production problems up to Cleveland engineers. Their know-how has never failed to cut production costs.

Write today for Catalog No. AR-89

THE CLEVELAND TAPPING MACHINE CO.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

CANTON 6, OHIO

For Better Tapping - - Faster!

CLEVELAND lead **tapping machines** screw

pendability and the willingness to give extra effort in time of emergency, or help in solving an especially troublesome problem. However, the potential and actual power of such workers is lost if the foreman is hesitant in using it.

Many supervisors neglect to gage the full abilities of their men. They should find out, through personal contact, the extent of mechanical knowledge, ability to use that knowledge, and special qualifications of each of the men under their supervision. Every sensible workman knows it is too much to expect from his foreman that he know the last word on a special machine, but the foreman should know who are the specialists in his group on the various machines and lines of work.

The foreman who fails to capitalize on the experience, special qualifications and capabilities of his men displays a lack of leadership ability. When he uses the mistaken label of "loss of prestige" as a ban against going direct to the worker for help in solving a problem that baffles him, he is hurting both himself and the worker. In this case, the foreman himself is the bottleneck in the solution of the problem. In my experience with bottles, I've observed that the necks are always at the top.

Dislike of admitting defeat is an understandable human frailty. It is also an expression of ego. The foreman who believes himself infallible should realize that the bigger a man's head gets, the easier it is to fill his shoes.

Ignorance and doubt never settle a question. To waver about what to do, to hesitate, and doubt, and balance probabilities upon a matter that presents itself for decision, is a waste of power. It is better to make some mistakes than to lose time and force in debating the pro and con of an action.

Harry Kaufman
Philadelphia, Pa

H. J.
Here's a really fantastic letter!
P.W.

BANNER TOOL COMPANY

BANNER tools DETROIT — *Fine* TOOLS FOR INDUSTRY

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DETROIT 12, MICHIGAN

June 16, 1952

Cities Service Oil Co.,
3049 E. Grand Blvd.,
Detroit 2, Michigan
Attention: Mr. P. E. Watts

Dear Sirs:

We called upon the services of your lubrication engineer, Mr. A. J. Blake, in reference to a serious staining condition which we were having with our soluble oil. He analyzed this condition and recommended one of your Chillo Oils. This oil was tried and the rust condition eliminated to our satisfaction.

To our surprise on his next visit he was dissatisfied with our tool life and suggested we use a soluble oil called "Chillo A". Now not only do we have clean machines, but tool life has been increased 20%! While in our plant he asked permission to "look around", which, of course, was granted.

We were using a tapping compound with precision ground taps in order to hold to close tolerances. We did not consider tap breakage excessive but the removal of broken taps was sometimes rather expensive. He recommended we use "Chillo 10Z". Then came the surprise of our lives! With Chillo 10Z we have gone to commercial ground taps (a 300% savings) and can still hold our same tolerances, with a sharper thread, increasing tap life a minimum of 20% plus eliminating expensive removal of broken taps!

We also have a production stamping job which required a new set of dies every month. On his recommendation we tried Chillo 10Z with these dies. Now our die life has increased to at least two months...a saving in die life of 100%, disregarding labor costs. We also increased production 200% per die sharpening!

We tried the same oil on our broaching operation and found that instead of making two cuts we can get the same results now with one. We were using one of your competitors' hydraulic oils and you told us it was a "good oil" and would give us satisfactory performance. BUT, GENTLEMEN, WITH THE EXCELLENT SERVICE YOU HAVE GIVEN, PLUS THE TIME AND MONEY SAVED, YOU MAY REST ASSURED THAT ALL OF OUR LUBRICATING REQUIREMENTS WILL BE PURCHASED FROM YOU.

Yours very truly,

BANNER TOOL COMPANY

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MANUAL. WRITE TODAY

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LAMBS OR GOATS?

Will company dinners and similar entertainment tend to bring workers and management into closer understanding, or will the men feel their after-hours are being invaded?

"East is east and west is west, and never the twain shall meet."

There are many people who have read those words of Kipling's and most readers are of the opinion that he was not writing about the terrain, but the quality of human relationships.

There have been many instances where attempts have been made to bring the brass and the plant employees nearer together by means of dinners, yes, even by complete banquets, but, in the greater number of cases, the breakdown between the two in order to make a greater familiarity possible, has not been accomplished, nor have the lines of demarcation been erased.

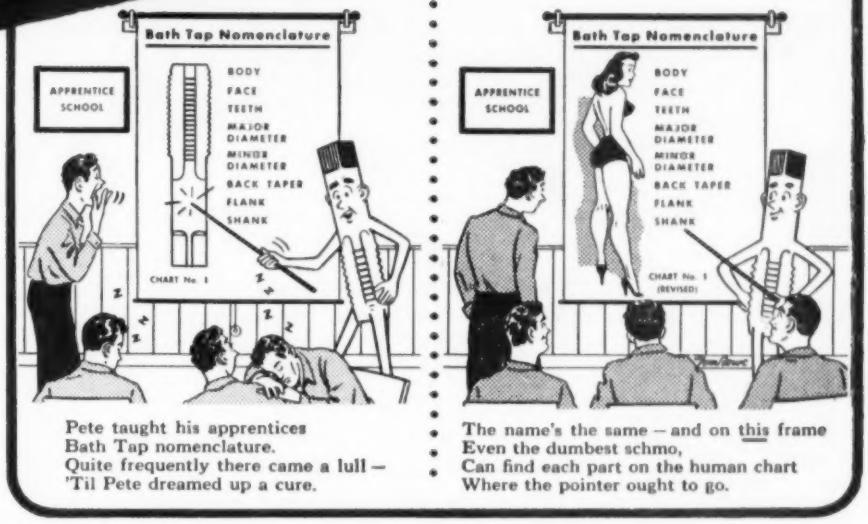
In the case under consideration, the fact that the big boss is to be present at the dinner will scare some of the men in Al's department, and they will not attend; others will be glad that the boss is to be present and they will be courteous and pleasant toward him, while a few will have enough booze in their stomachs before the event starts to make them boisterous and uncouth and they will talk more than their share.

In all shops there are certain individuals who will always be grouches, and there are those who think that the only favor which the firm can render is to put more dough in the pay envelope whether they deserve it or not.

Enemies like O'Hara and Harris at the dinner will probably be about as sociable as two hunks of wood lying side by side, whether they eat together or work together. Evidently, it has not been thought out by Al and so he doesn't realize that both will enjoy their meal better if

"It'll revolutionize the industry — prints in 3-D!"

TAP-ODDITIES



Pete taught his apprentices
Bath Tap nomenclature.
Quite frequently there came a lull –
'Til Pete dreamed up a cure.

The name's the same – and on this frame
Even the dumbest schmo,
Can find each part on the human chart
Where the pointer ought to go.

Tap nomenclature is important, but it is the manufacturing perfection in such things as chamfer, pitch, hook, rake, thread angles and other important characteristics, that make Bath ground thread Taps so effective and economical.

More is demanded of taps than almost any other cutting tool. They are expected to operate under confined chip space, lack of lubrication and other adverse conditions. That's why more consideration should be given to expected tap performance.

Instead of buying taps – it's the final cost per threaded hole that counts.

Analyze the job – make your Bath Tap selection in accord with the thread to be cut, the metal to be worked, tolerance required and tapping machine to be used – or, give this information to Bath engineers for their recommendation. They can help you get more threads per dollar – show you how to get Better Threads with Bath Taps.

INSIST ON BATH TAPS – PROFIT BY THEIR PLUS – PERFORMANCE

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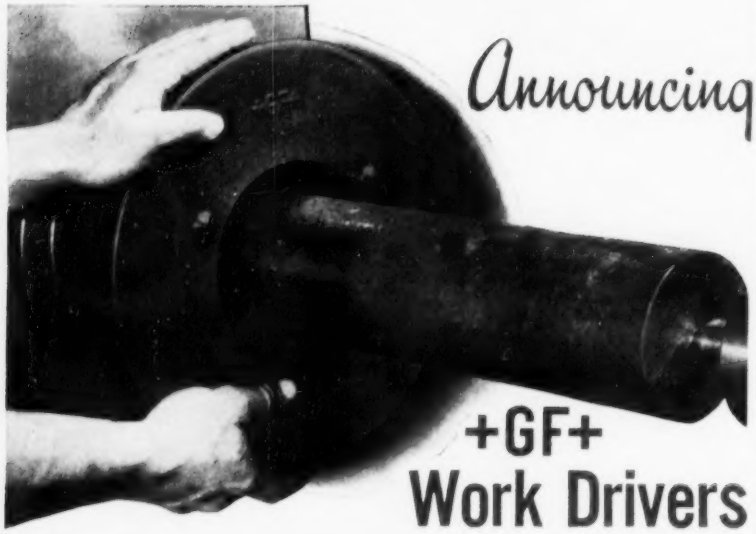

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Work Driver with hood removed

Skinner is proud to announce its appointment as exclusive distributor for the George Fischer line of patented lathe work drivers. The +GF+ consists of 3 eccentric jaws (6 on largest size) which have floating spring action to accommodate smooth or rough bars and forgings. A smooth protective hood covers all mechanism, and also acts as a manual opening and closing device for the jaws. A slight turn of this hood opens the jaws, and holds them open, until work is placed between centers—another turn releases the jaws to grip the work. Any increase in tool pressure and spindle speed automatically increases the holding power of the +GF+. Jaws are easily reversed to accommodate direction of spindle rotation. Skinner carries a complete stock of +GF+ drivers and replacement parts.

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203 Edgewood Ave., New Britain, Connecticut

Turn hood out of index position — Turn work piece against jaws

Turn work piece away from jaws — Turn hood until index snaps in

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they are apart. Experience proves that few if any men will make up and become friends simply because a feed has been set up in better surroundings than they have at home. It takes more than this to do it.

If the big boss has a desire to get closer to his men, wouldn't it be better for him to stroll around through his plant and enter their sphere of life, in a small way, by talking to the workers occasionally? He cannot get "beneath the skin" by attempting to get them into his circle of existence, because steak and lobster positively will not do this for him or them.

Isn't it better to hit a trail which will lead him to some machine where an operator is working and doing his best by turning out his part of the product which will go into the production line?

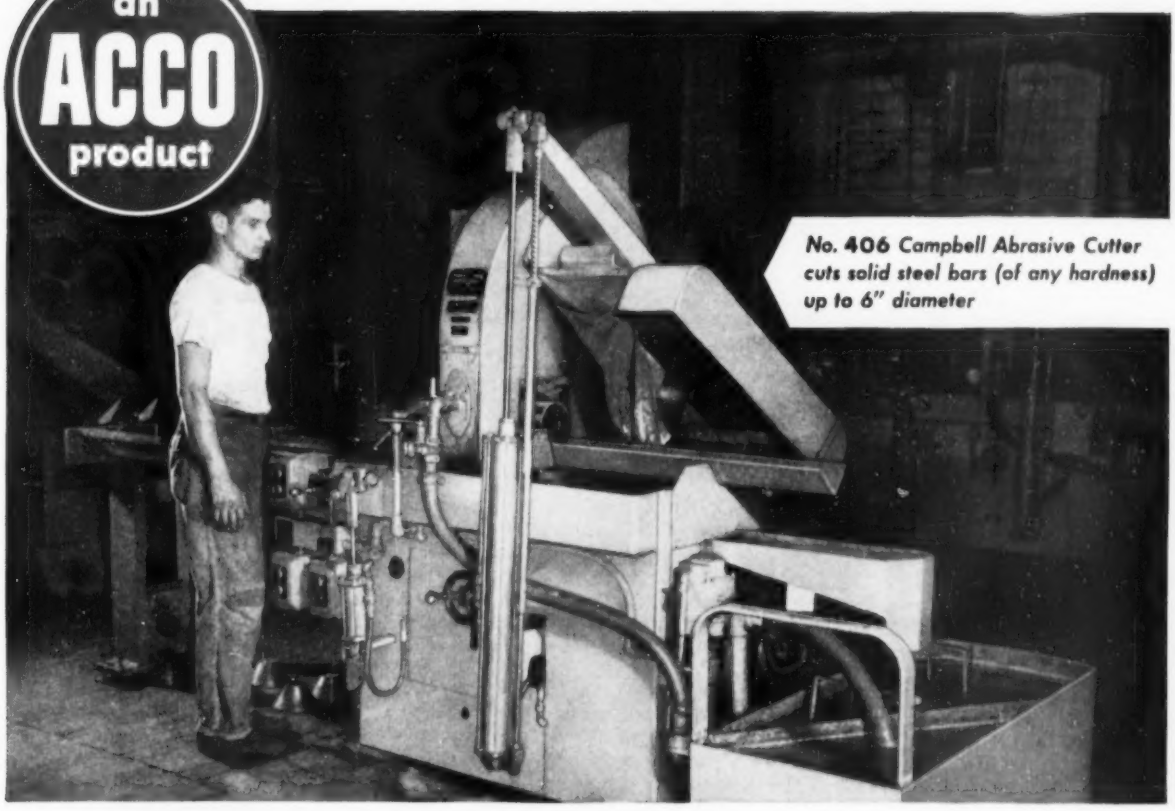
A little conversation between a representative of the management and the workers has done much in many plants to cause the men to consider themselves as really belonging where they are. By this simple process there is a tendency for production to increase, but it is the brass who must lead off.

In one large plant the manager (a millionaire) is very close to many men throughout the organization; he purposely has good assistants in his office so he himself can watch the product as it is made in the shops.

Naturally he comes in contact with many workers in the plant; he can call many of the men by their first names. When a new employee comes to work, he is usually spotted by this manager who approaches him with a few words of greeting and encouragement. Then he learns the name of the man, says he hopes he will like it there, and then passes

"Fenwick, we'd prefer you to use our regulation face shields!"

an ACCO product



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CAMPBELL Abrasive Cutting Method Sets New Cut-Off Standards

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Perhaps you have cutting problems that can be solved with the speed, accuracy and quality of cuts you can get on a CAMPBELL Abrasive Cutter. If so, let us prove what this remarkable machine will do on your own material. Let us show you before your own eyes.

No matter what hardness or shape of metal you must cut repeatedly, if it will fit on one of many sizes of CAMPBELL Abrasive Cutters, which have a range up to 8″ diameter solids and 20″ diameter tubular, we'll show you how to cut it faster and better. Write today for "*Principles of Abrasive Cutting.*" Give us the material specifications and we'll be glad to make recommendations.

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Grinding .010" chipbreakers in ½" x ½" square solid carbide.
METHOD USED..... Wheel wear $.07 per tool
PRECISION METHOD: Wheel wear $.014 per tool
TIME SAVED..... 66%

SAVE ON MILLING CUTTERS

Grinding 16" 24 blade milling cutters.
METHOD USED..... Wheel life 80 to 90 cutters
PRECISION METHOD: Wheel life in excess of 500 cutters
TIME SAVED..... 50%

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Precision Diamond Tool Company's efficiency studies have saved millions of production dollars for hundreds of manufacturers everywhere. They can do the same for you. We will welcome the opportunity to prove this statement.

TODAY!

Give us a call . . write us a letter . . or simply clip and mail the coupon.

PRECISION DIAMOND TOOL CO.
ELGIN, ILLINOIS

on. The next time they meet, there is a friendliness which would not be the case if he, the manager, had not made an effort to introduce himself.

This manager probably receives more friendly "Good Mornings" than any hundred men in like positions. On the other hand, he never draws any of them into his circle of personal friends.

The two factions of the brass and the brawn will never unite, so it is as in the old saying "A cat may look at a king," but the king still remains a king and the cat is, as ever, a cat.

F H Stebbins
Worcester, NY

•

BACKFIRIN' DISCIPLINE

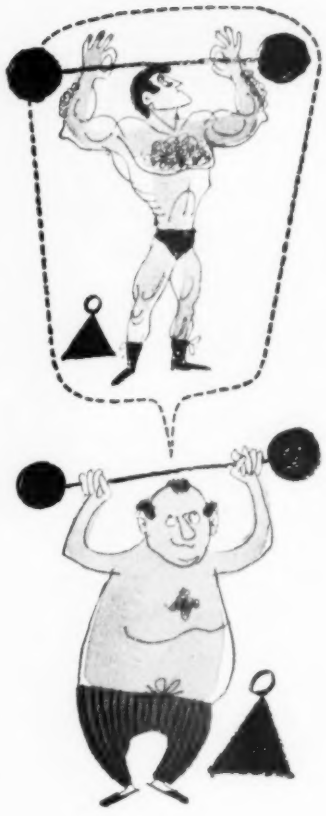
What is the best way of impressing workers with serious consequences of an important mistake? Is discharging such a worker always the answer, or suspension for a limited period? Sometimes other factors should be taken into consideration...

I don't think it's fair to fire Old Man Watkins because he once misfed a press. A man who has a fine 15-year record should be worth a good deal to any company even if he, as in this case, made a mistake. Any man working anywhere should at least be given two chances. I believe in the slogan that anybody who never made any mistakes doesn't do much useful work either.

If Watkins is to take the blame for his failure of not being able to keep the deliveries to the Chicago firm, Al should also be blamed for giving this rush job to the old man, because Al should have known better than to stake such an important delivery on an old man's performance.

Reversing Al's and Watkins' positions, it's very likely that Al would have made the same mistake if he'd pushed the job as Watkins seems to have done.

It looks to me as if Al is not so familiar with press jobs. I wonder if he realizes that in that kind of work even the smartest toolmaker may burst a die for reasons out of his control. It need only be that a bolt is pulled apart the moment the ram descends, or, as seems to be the situation in this case, that two blanks stick together so close that nobody can see it's two pieces. Al should have prevented the accident by seeing to it that the blanks were separated before delivered to this press. The die was perhaps also faulty in its design. Risks of this



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THE TORRINGTON COMPANY
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553 Field Street • Torrington, Conn.

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kind must always be taken into account at any place of work.

I don't believe Watkins misfed the press because of lack of disciplinary measures. I think it was a pure accident. If Watkins was careless, then Al was careless too, for reasons mentioned above. These kinds of accidents happen at places where the hardest kind of discipline is practiced.

Ed is wrongly pointing out that if Al let Watkins get by with the mistake without punishment the rest of the crew might get careless, too. Just as though all good work turned out is the result of disciplinary steps! I bet Al 10 to 1 that Watkins and the rest of the fellows want all to turn out good jobs and that they all regret Watkins' and the company's misfortune.

If the big boss didn't tell Al to fire Watkins, I don't see any reason why Al should tell him to leave. To prevent similar accidents I think Al and Watkins should talk things over and try to find out the real reason for the accident.

It wouldn't be fair to send Watkins home for a few days either, because he would take that as an unrighteous punishment for an accident he was unable to prevent. No punishment should ever be passed for accidents of any kind. Punishing a man for an accident wouldn't prove to the men that there was some discipline around Al's shop. On the contrary, I think this would make things worse.

Al's reminiscence of the days when one of the foremen's main duties was to hire and fire shows that he is living behind times. It's a good thing for the skilled men that their services are appreciated, and it's equally important that such help be kept so they can perform their duties.

A E Fristedt
Stockholm-Bromma, Sweden

"—and he says I'M a clock watcher!"

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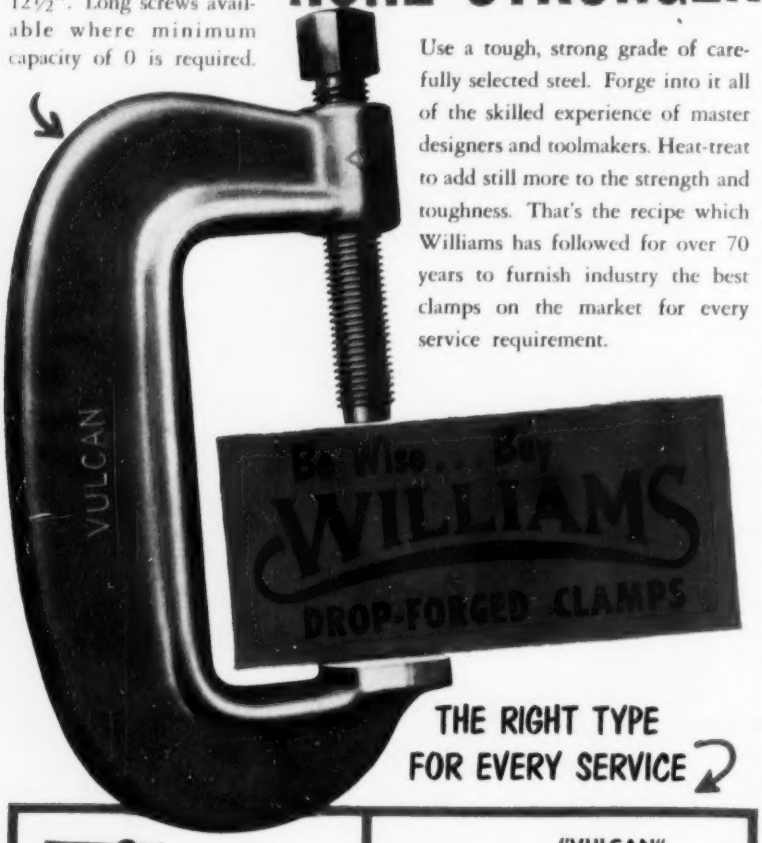

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in 4 sizes with maximum capacities from 1¼" to 4¼". Jaws remain parallel.

"VULCAN" TOOLMAKERS'

in 4 sizes each of 2 types. Plain screw 1" to 4¼"; swivel screw ¾" to 4". All screws with wings to permit use of lever in tightening.

DEEP THROAT

in 7 sizes with maximum capacities from 2" to 12". Special threaded screws for rapid adjusting. Also in cadmium plate finish to resist welding spatter.

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Williams Tools are sold through your local Industrial Distributor who can supply your needs.

IN SO-CALLED good old days, it was not unusual that a man starting to work in the morning did so with the insecure feeling that perhaps he would not last the day out—especially if the boss was of the hire 'em-fire 'em type. A broken drill or tap, a misused reamer, or even a bit of loud talk in the shop would provoke a layoff by the boss with a whip. This attitude varied more or less with the "law of supply and demand" for shop help—and abundant supply of manpower seemed to invigorate some bosses, so that they would assert their alleged bigness by increasing their willingness to fire a man at the drop of a hat.

Times have changed, however. The supply of skilled shop help is tight, and plenty of work is available so present-day bosses tread lightly. They have learned more about labor relations, they understand more about human engineering, they also realize that a man does not deliberately ruin a job or wreck a press die. Something happens beyond a man's control and, bingo—there's a wreck. The big problem then is how to salvage the job, how to pacify the customer? Firing the man will do neither. Why not put the man on another job immediately, something not so critical, then go about the task of salvaging the job and the customer. Meanwhile give the man an opportunity to reason out just what happened and why. With this information assimilated, the chances are he'll not have this same type of accident again and you'll still have a good man in the shop.

On the other hand, if the damage was the result of deliberate carelessness or indifference, the obvious thing to do is to let the man go—not in a fit of anger, however, but by calmly explaining that it would not be fair to the man himself, the boss, or to the other men in the shop, to have a man around whose attitude was such as to jeopardize the welfare of all concerned.

Henry George
Dayton, Ohio

IN THE CASE of backfiring discipline the workman ruined a die which cost the firm a great sum of money. No mention was made about any previous mistakes or carelessness on this worker's part. He is admittedly a good worker with 15 years' service. It appears that management may be wrong in this case.

Mistake number 1 is that management is only assuming it was carelessness. Mistake number 2 is that they were not sure the die was satisfactory for feed. No mention has been made about a complete examination of broken die, the machine it was assigned to, or any other parts. This was mistake number 3 on management's part.

After this costly accident there should have been a general conference to determine the facts. Score number 4 mistake for management. It is only after a discovery of facts we apply discipline. If we dig far enough into all the facts we usually find out the reason for these misadventures. If we do not find out the reason, we have done nothing to prevent a recurrence.

If it is found that the workman has been careless he should be given a warning and placed on probation. The worker has 15 years' service and a good record aside from this one incident. It would be foolish to fire the employee in this case. We are all human and we make mistakes. The only difference is that some are costly while others are hardly noticed.

A E Salmons
Philadelphia, Pa

•

BAIT FOR SPEED

Will an emergency job get better handling if there's a reward in the offing? Or will a responsible worker realize that the company's advantage may be his own?

WHEN YOU HAVE to offer bait to get a job done on time, there is something wrong with supervision.

When a breakdown, or any other job for that matter, is brought into the shop, it should be studied and analyzed by a competent supervisor whose responsibility it will be to get the job done.

After intelligent analyzing, a tentative estimate of time and material needed should be made and a deadline set for completion. Knowing how much time and material will be needed, the supervisor can assign the required number of men to the job. He must engineer the job, by breaking it down into simple operations. He must direct the efforts of

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3800 PER HOUR!
2500 PER HOUR!

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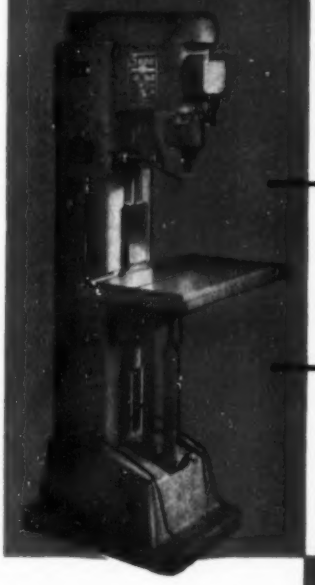

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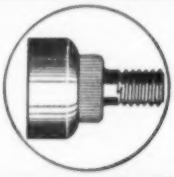
FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING
Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine

TAPPING
Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine

THREADING
3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

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Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Submit Sample Parts for Production & Cost Estimates

Save Time and Money ... Select

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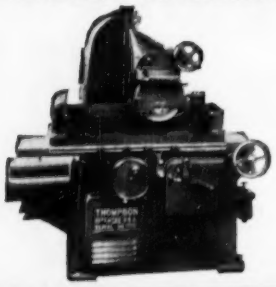
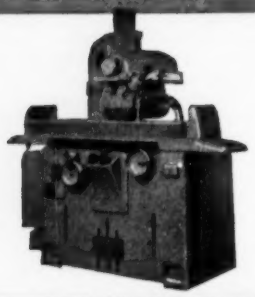


TYPE B Small General Purpose Grinders sizes from 6x18x18 to 12x18x120

TYPE C & CX Medium and Heavy Duty Grinders sizes from 18x16x60 to 36x36x240



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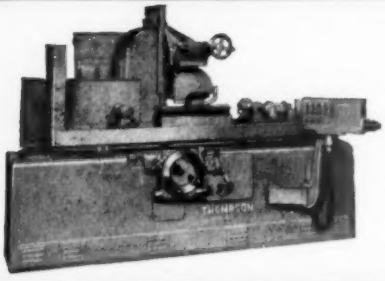
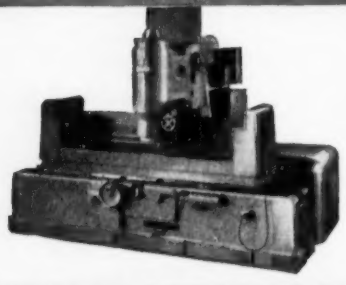


TYPE B & C TRUFORM Contour Grinders for all shapes sizes 18x18x30 to 36x36x54



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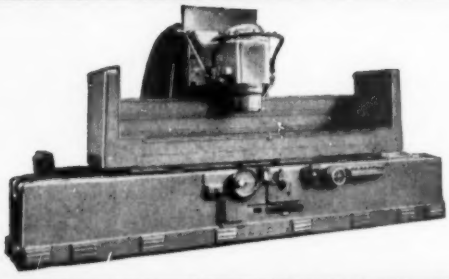

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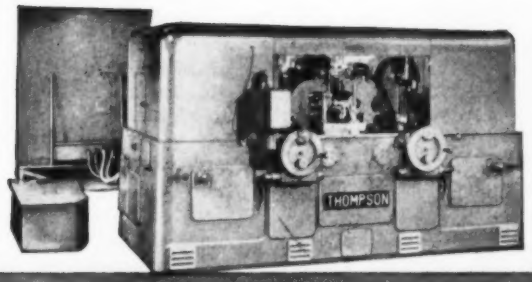

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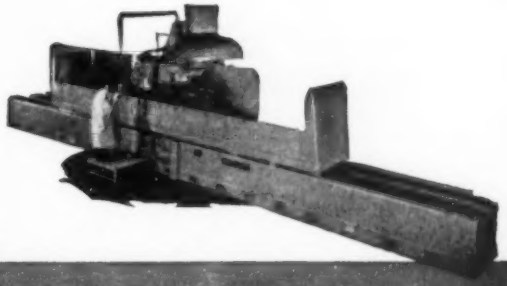
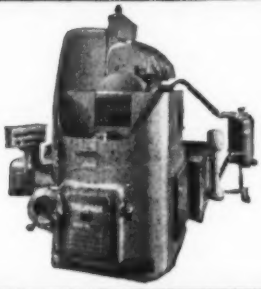
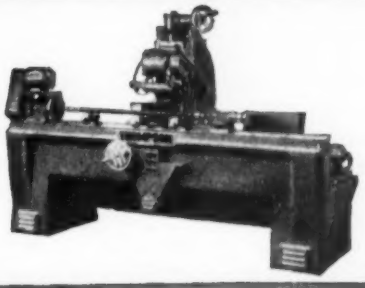


WAY GRINDERS



TWIN CHUCK ROTARY GRINDER For grinding circular metal discs 6 to 18 inch and 6 to 16 inch sizes



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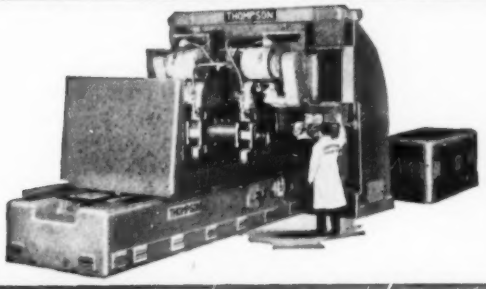

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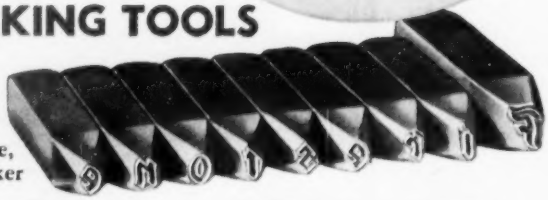

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TRADE MARK STAMPS—Faithful reproductions made to your specifications in any size . . . any style . . . for every marking job.

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the men, seeing that each does his assignment efficiently—he must see that necessary tools and materials are at hand.

The men working at their usual pace, but guided by a competent leader, will do as much work without bait as they could do if baited and left to their own devices.

Good leadership will accomplish more and better work with a standard pay rate than unguided help will do regardless of the size of the bait offered.

Henry George
Dayton, Ohio

•

JUNGLE LAW

How much responsibility has a foreman toward his company in the matter of lining up and training a successor, particularly if he is considering leaving the firm eventually?

THERE IS NO REASON why a retiring foreman should not offer the name of his successor if he is asked for it. Most foremen would be flattered by such a compliment to their judgment and would hasten to nominate a successor. It is a common practice. The main problem, as I see it, would be to persuade the nominee to take the job.

Most shop men grumble about their foreman's ability to run the shop and can usually think of several of their work mates who could do it better. Unfortunately, when the situation arises in which a new foreman is needed, potential candidates express the desire to be passed over, as they are content with the work they are already doing. This is the situation which leads to outside men being appointed as foremen, thus providing material for more controversy in the shop.

The outside man should be looked upon as foreman material only as a last resort when all possible candidates on the shop floor have been proved unsuitable or unattainable. In cases where the home-grown foreman material proves uncooperative it is up to the management to dig in their toes and begin to put over a good deal of sales talk. Surely, the reluctance of their own men to accept promotion is an indication that something is wrong with the way the foremen are treated by the management. The very fact that there is a vacancy in the ranks of the foremen should also mean something of significance to the management.

A foreman should not be allowed to depart from a firm with which he has worked well for a considerable

Pressure Processing

. . . whoever uses it in their production is a customer or potential customer of **H-P-M**

DRAW . . . TRIM . . . PIERCE . . . and FLANGE in ONE OPERATION on this H-P-M!

That's the way Dura Steel Products Co., Los Angeles, handles the high-speed production of medicine cabinet bodies on their versatile 300-ton All-Hydraulic H-P-M, equipped with a two die set-up. One die draws the 16" x 26" cabinet body to a depth of 4-1/8" while the other die simultaneously handles the flange, pierce and trim operations. The press shows great versatility in handling many of the intricate jobs which are accepted from government agencies and other manufacturers.

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the *tougher* the cutting job . . .
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Today's applications for abrasive cutting are as *ingenious and practical* as the one shown above is ridiculous. It is used to cut all kinds of metals, from aluminum to uranium, as well as glass, ceramics, plastics, and building materials . . . and most important, it *cuts faster, cleaner, and cheaper.*

If you have a cutting problem, investigate the abrasive wheel method. Call Allison, *specialists in abrasive cutting for 30 years.*

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THE *only* WAY TO CUT SOME

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SALESA

period of time without some higher executive inquiring into the man's reasons for leaving. It is probable that a frank discussion of the situation will indicate to the executive some line of action which will help persuade the straying lamb to return to the fold.

It is surprising what small things cause a man to pack up his job with a particular organization. It has nothing to do with money in most cases. Many managements often wish that money were the only arguing point, as it is a relatively simple antidote for a simple malady. What makes a foreman want to leave is very often his treatment by higher executives who make the mistake of regarding him as a slightly higher grade machinist who is expendable.

Of all the men who work on the shop floor, the average foreman can be looked upon as an unique individual. The nature of his job, with its wide range of influence, makes him a walking encyclopedia on both the firm's products and activities. The management have paid for the stocking of the foreman's mind with all the knowledge he has acquired and it is false economy to allow this knowledge and ability to walk out of the door to be lost for keeps.

If managements realized what they have invested in a foreman and what gains they could make in the future from their investment, they would not allow him to get away from them so easily. Unfortunately, too many higher executives suffer from an all-consuming vanity which will not allow them to raise a finger to hold a man who no longer wishes to work for them. If they could bear in mind the capital investment which a foreman represents, everyone concerned would benefit considerably.

Assuming that a foreman wishes

"No clock in this department. Everybody keeps his eye on Jones — hasn't been off a minute at quitting time in 20 years."

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that builds reputation
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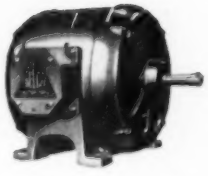
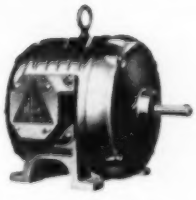


Open Ball-Bearing Motor



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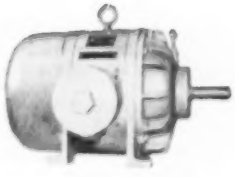

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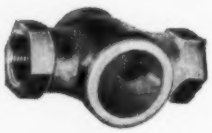
More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & DeLeeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.

Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.



Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

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to quit because promotion in the near future does not seem possible, it is a good idea for the management to start doing some leaning over backwards in order to reach some practical means whereby the man can be retained. What is wrong with shifting the foreman to some other branch of the firm's activities? Make him a jig and tool designer, for instance. The effect on some tool-design offices would be positively atomic if a foreman from the shop floor were put in charge. There are a host of jobs which a foreman is well fitted to perform in the average engineering organization. Technical sales and correspondence, for instance, machine demonstrating, planning, estimating, progressing, inspection and as a watchdog on product design to insure that economical production is borne in mind by the designers. If a firm performs none of these functions, then it might be a good idea to employ a disappointed foreman on several of them; he would earn his pay.

The progressive firm is always changing people and plant around and making expansions. It is rare, in such firms, that foremen wish to leave, because the fluid position leaves them something to look forward to in the future. They never know what is going to happen next. Conversely, the firm which has got into a rut cannot expect to hold the ambitious man who is keen to make progress upward, instead of horizontally. Management should take seriously any tendency of foremen who wish to leave, as it is a sign that the firm is bogged down.

Clifford T Bower
London, England

THERE SEEM to be two questions involved in this case study. One, whether a foreman should have a trained lieutenant to take over in case of illness or withdrawal from the company, and the second question, should a man try to advance himself through job changes? These are related subjects but are not always tied together into one problem.

"You won't have any trouble with him if you get on his good side."

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the revolutionary new coolant system that . . .

keeps cutting tool and work at room temperatures!

lo-jet acro's *proven results in America's leading industries are making production history, from coast to coast!*

* Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

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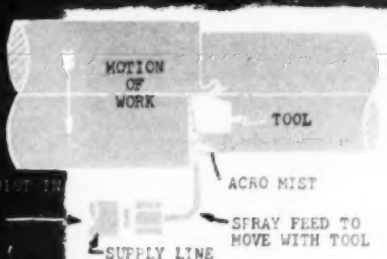

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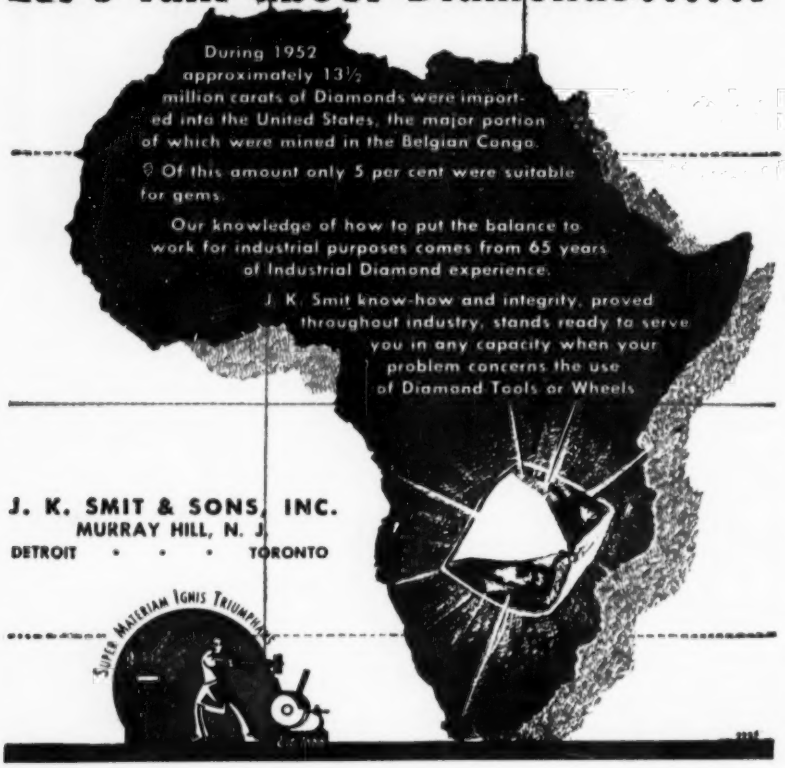
TOOL COLUMBIA STEELS

Let's talk about Diamonds.....



During 1952 approximately 13½ million carats of Diamonds were imported into the United States, the major portion of which were mined in the Belgian Congo.

Of this amount only 5 per cent were suitable for gems.

Our knowledge of how to put the balance to work for industrial purposes comes from 65 years of Industrial Diamond experience.

J. K. Smit know-how and integrity, proved throughout industry, stands ready to serve you in any capacity when your problem concerns the use of Diamond Tools or Wheels

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SUPER MATERIAM IGNIS TRIUMPHANS

Since the questions under study can be broken apart, perhaps the best method of considering them is to take them up individually. The importance of the two questions is equal and both are common problems.

Should one train his own replacement? Naturally the reaction to this problem is the negative answer. The individual who is not a thinker in the realm of advanced management can never see, by himself, the value of training someone to help him. The old fear of self-preservation which is constantly with us always will say "don't do that." We trust people and yet we don't. We are willing to believe companies until they burn us and then we become cynical toward all companies.

The normal tendency of people today is to feel that if someone else knows our job as well as we do, he might get it at a lower figure than we are being paid. Thus the elimination of one person. Why do we think that way? Didn't company XYZ just do that to Bill? Bill trained his replacement and look what they did to him. Why, the guy Bill educated in the business was willing to take over Bill's job for less money, so they let Bill out. How many times have you top management men heard that statement? How many times has it been true? At least a few, no doubt, and those are the times which keep coming up to hinder the advancement of personnel management.

Again, people don't forget and they use little logic; they apply to their own predicament those things they see happen to the other fellow. What should be done? What can be done? The only possible way to overcome the tendencies in any person is the understanding of the basic idea and then, through years of education, build up a solid foundation where

"What happened? What happened? Can you still work?"

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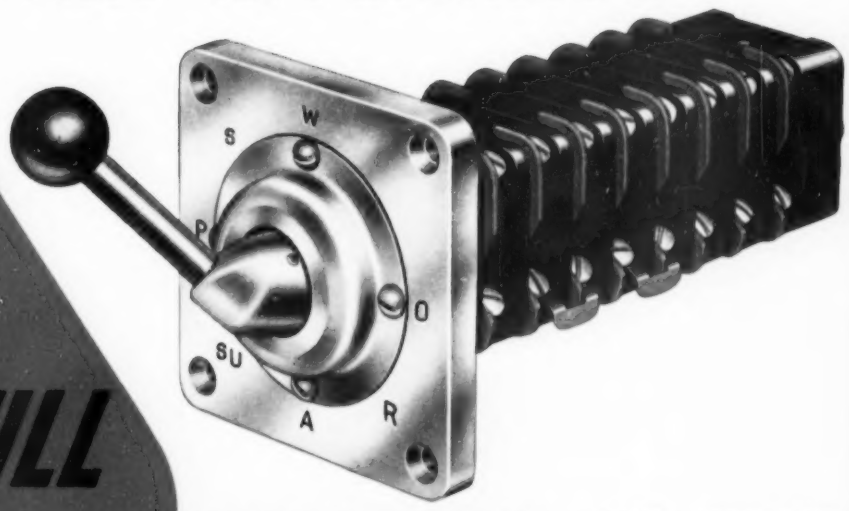
with the

ARROW AH HART



PUSH-PULL SELECTOR SWITCH

SAVES APPARATUS AND SPACE . . . PROVIDES SIMPLIFIED CONTROL

COMPARE
A 2-SPEED REVERSING LATHE
8 OPERATIONS

involving spindle motor, coolant motor, brake and a "Safe" position.

CONVENTIONAL CONTROLS	AH "PPS"
6 Magnetic Units	1 Magnetic Unit
7 Push Buttons	1 "PPS" Switch
11 UNITS . . .	SAVED

COMPARE
A DRY CLEANING MACHINE
8 OPERATIONS

involving fan, pump, washing and extractor motors and "Automatic" and "Off" positions.

CONVENTIONAL CONTROLS	AH "PPS"
6 Magnetic Units	3 Magnetic Units
1 Timer	1 Timer
14 Push Buttons	1 "PPS" Switch
16 UNITS	SAVED

COMPARE
AN AUTOMATIC BAKELITE PRESS
8 OPERATIONS

involving a choice of jogging for each separate function or completely automatic cycling.

CONVENTIONAL CONTROLS	AH "PPS"
6 Magnetic Units	2 Magnetic Units
1 Timer	1 Timer
9 Push Buttons	1 "PPS" Switch
12 UNITS . . .	SAVED

THE SIMPLE ANSWER TO YOUR COMPLEX CONTROL PROBLEMS

REDUCES CONTROLS REQUIRED • SAVES SPACE and WEIGHT • IMPROVES LAYOUT and APPEARANCE • ADDS FLEXIBILITY, VERSATILITY • PROVIDES MAXIMUM SPEED, EASE and SIMPLICITY of OPERATION • FOOLPROOF, PROTECTS OPERATOR and EQUIPMENT • ASSURES PEAK PERFORMANCE

TURN THE PAGE FOR AN ELECTRICAL DESCRIPTION and OPERATIONAL FEATURES

Control TAILORED TO YOUR EXACT NEEDS

— THE ARROW-HART "PPS" SWITCH IS CUSTOM BUILT TO YOUR SPECIFICATIONS FROM STANDARD COMPONENTS

STANDARD CONSTRUCTION WITH CAST LEVER HANDLE ILLUSTRATED

Standard Construction or Oil and Weatherproof Models are available with a choice of 4 different Handle Types.

What the "PPS" does

- **A SINGLE "PPS" UNIT PROVIDES SINGLE-POINT CONTROL** . . . involving practically any desired circuit arrangement.
- **THE "PPS" REDUCES THE NUMBER OF CONTROLS REQUIRED**
  - — because it is the **ONLY** pilot device required for practically all installations.
  - — because the "PPS" makes a single ***MAGNETIC*** control (starter, contactor etc.) do the work of many.

Here IS THE BASIC OPERATING PROCEDURE SIMPLE AS A-B-C

A **PUSH and TURN TO SELECT** . . . The operator must first push the handle — opening all circuits and disconnecting all controls. The handle can then be turned to any desired position; this selects the correct circuits for the required function. Any number of unwanted, intermediate functions can be passed without energizing their circuits.

B **PULL TO START** . . . With the handle in the desired position, the handle is **pulled** to start the operation — the same as actuating a conventional "Start" button.

C **PUSH TO STOP** . . . Pushing the handle immediately stops the operation. "PPS" single-point control is safer in emergencies because there is never a delay to find the right button.

Tested, Accepted ...and Acclaimed

Leading manufacturers and designers of new equipment, plant engineers and maintenance men, and operators everywhere who have worked with and know the "PPS" are universally sold on its benefits. Although it is revolutionary and relatively new, the "PPS" has been thoroughly tested on innumerable installations and found OUTSTANDING.

IT WILL PAY YOU TO KNOW MORE ABOUT THE ARROW-HART "PPS" SWITCH

This new concept in motor control can help solve your present tough control problems . . . and help you build peak performance into your new designs. Use the coupon, attached for your convenience, to send for completely descriptive literature including a sample Target Sheet for plotting your circuit requirements.

Industrial Control Division
THE ARROW-HART & HEGEMAN ELECTRIC CO.
103 Hawthorn Street, Hartford 6, Conn.

Please send me ☐ *complete information about the Push-Pull Selector Switch.* ☐ *Also the A-H Design Story folder featuring Type "RA" Magnetic Motor Controls.*

NAME _____

CO. NAME _____

POSITION _____

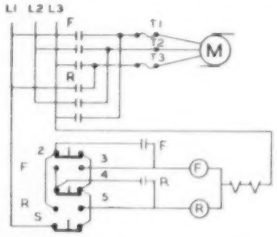
ADDRESS _____

CITY _____ **ZONE** _____ **STATE** _____

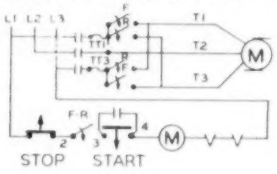
How the "PPS" works

To explain the action of the "PPS", let us look at an example; the simplest possible is the standard reversing of a motor. This example will show how the required number of magnetic units is reduced and how single-point control will serve for any number of operations.
While your own actual control application may be more complex than this example, it will simply entail using enough additional circuits to accomplish the required combinations of load and control hook-up.

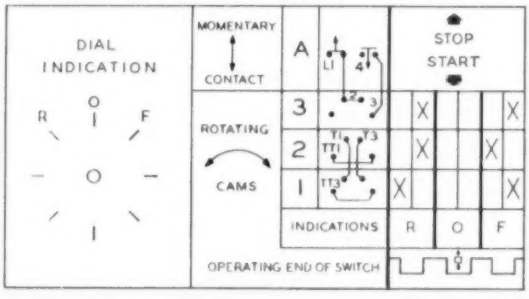
CONVENTIONAL CIRCUIT . . . This diagram shows the familiar type of reversing circuit. 3 push buttons and 2 magnetic units are required.



"PPS" CIRCUIT . . . Here the Rotating Cam Sections of the "PPS" select the circuit, and the Momentary Contact Sections operate the motor as desired. The diagram also shows the symbol used for "Stop" by pushing and "Start" by pulling. Only *1 magnetic unit* and *1* pilot device, (the "PPS"), are required.



THE "TARGET SHEET" . . . shown here in abbreviated form, is the means by which your control requirements are translated into a diagram for the construction and wiring of a "PPS" Switch. A wiring diagram strip shield is visible from the top of every switch you buy indicating the terminals and all internal and external connections on the "PPS".



Printed in U.S.A.

ARROW-HART
INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD 6, CONN., U.S.A.

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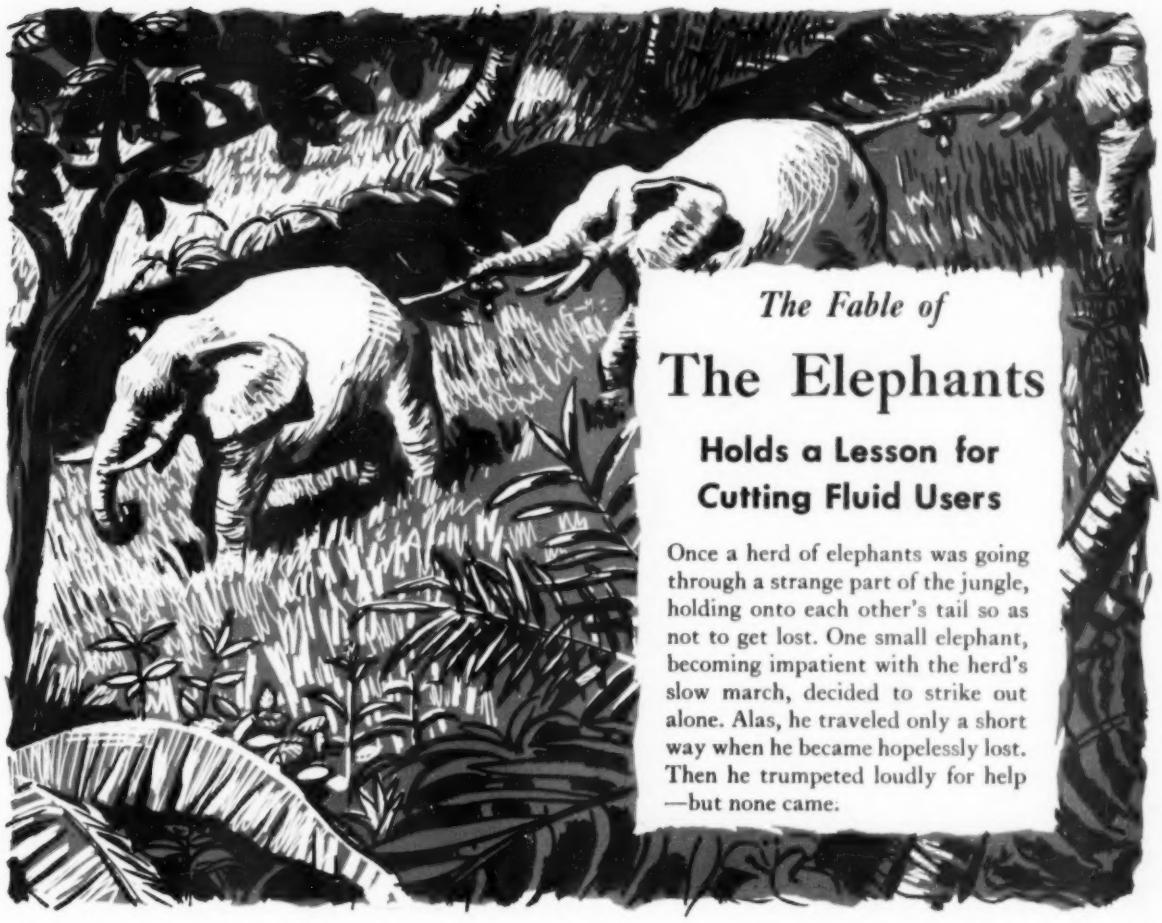

The Fable of

The Elephants

Holds a Lesson for Cutting Fluid Users

Once a herd of elephants was going through a strange part of the jungle, holding onto each other's tail so as not to get lost. One small elephant, becoming impatient with the herd's slow march, decided to strike out alone. Alas, he traveled only a short way when he became hopelessly lost. Then he trumpeted loudly for help —but none came.

The Lesson:

Like the little elephant in the fable, it is easy to get lost in the cutting fluid jungle. You need something to follow if you are to stay out of trouble. Realizing this, Stuart Oil has devised a unique Selector to serve as a guidepost to point out the path to the right cutting fluid. The Selector recommends cutting and grinding fluids which field experience has shown to be most suitable under average job conditions. Machinability ratings are listed, and complete instructions are given. Included are rules of thumb to follow when short tool life and poor surface finish are encountered.

To make going astray even more difficult, Stuart has developed the Dilut-O-Graph which tells how much cutting oil is required for a certain dilution when blending is done in tanks of different capacities. The Dilut-O-Graph ends costly guess-work.

Your Stuart Oil Representative will gladly give you a Selector and Dilut-O-Graph. And while he is in your plant, ask him to show you how Stuart cutting and grinding fluids will improve your machining results.

FREE CUTTING FLUID SELECTOR AND DILUT-O-GRAPH

In this folder is Stuart's Cutting Fluid Selector and Dilut-O-Graph. They are double-barreled protection against mistakes in selecting and preparing cutting fluids. Instructions are included. Fill out and mail coupon.

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26-year record proves DUMORE® GRINDERS give low-cost, accurate service

Mounted on a Universal Grinder, the Dumore operates at a spindle speed of 40,000 rpm. Work speed is 300 rpm.

How DUMORE insures high-speed internal grinding . . . mirror finish at low cost

PRODUCING drill chucks requires a difficult jaw grinding operation. Smooth finish and correct back taper are necessary. And each day, the grinder must withstand millions of hammer-like blows transmitted to the grinding wheel and spindle bearings.

Since 1927, this chuck manufacturer has used DUMORE precision grinders. Here is his report:

"Our Dumore No. 5 units operate 100 hrs. weekly to internal grind open jaws for our ⅛" to 1" plain bearing key type chucks. Material is 60 Rockwell C hardness alloy steel. We remove .005".

"The Dumores are well adapted to this fine work and produce a glass-like finish. Their sturdy power transmission, solid spindle shaft, self-oiling features, air-cooled motor and variable speeds make them exceptionally well suited for this work. They deliver continuous operation with little effort and very low maintenance cost."

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The Dumore Company

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little chips at the corners will not crack the structure.

Foremen and supervisors alike must be made to see the value to themselves of training assistants who can act when they are not available. Why? In the first place a good supervisor is a good organizer. A good organizer does not do much of the labor himself. He trains, guides and sees that someone else does his hard work. Through this process it is necessary to have someone who can be trusted—someone capable of handling the details. Usually the assistant can do anything the boss can except make final decisions.

The actual important fact in any supervisory position is the ability to make correct decisions in line with company policy. This cannot be done without first knowing the company policy and working closely with all supervision. The assistant does not actually get in on this phase of the work. However, a good man, well-grounded in carrying out orders and supervising smaller groups of people, can usually step into this final phase without too much of a problem. The company naturally has the responsibility of training him at that time. Now our foreman need not fear that his assistant will take over unless he himself fails to make decisions or follow company policy.

Many companies have operated for years with a good top-notch foreman, with his own good assistants who handle all the details except the final decisions. Many assistants have been taken and made into full-fledged foremen in new departments. Some have stepped up and the older foremen given more responsible jobs. The key that unlocks the picture is that when management needs people to be advanced or to fill a better position they first screen their own organization. Too many times qualified people are available but because these people do not have a replace-

"That new designer has got to go!"

Typical application for Atlantic cutting oils, showing a Barber-Colman milling machine.

NEW ATLANTIC cutting oils

for high production on tough jobs

Here at last is really effective help in keeping production high in your milling, turning, and drilling departments.

With these new Atlantic non-soluble cutting oils, you can maintain high production rates without the handicap of foul odors on hot tough jobs. Work is visible right through the oil. And the oils are compatible when blended—even down to the heaviest grades. Operators like these new oils better too, because they don't indelibly stain hands or clothing.

Get complete information on these new oils and your copy of the Atlantic Cutting Oil Selection Chart. Learn about this superior measure for cutting oil efficiency . . . determined by performance rather than chemical composition. Write your nearby Atlantic office listed below, or The Atlantic Refining Company, 260 South Broad St., Philadelphia 1, Pa.

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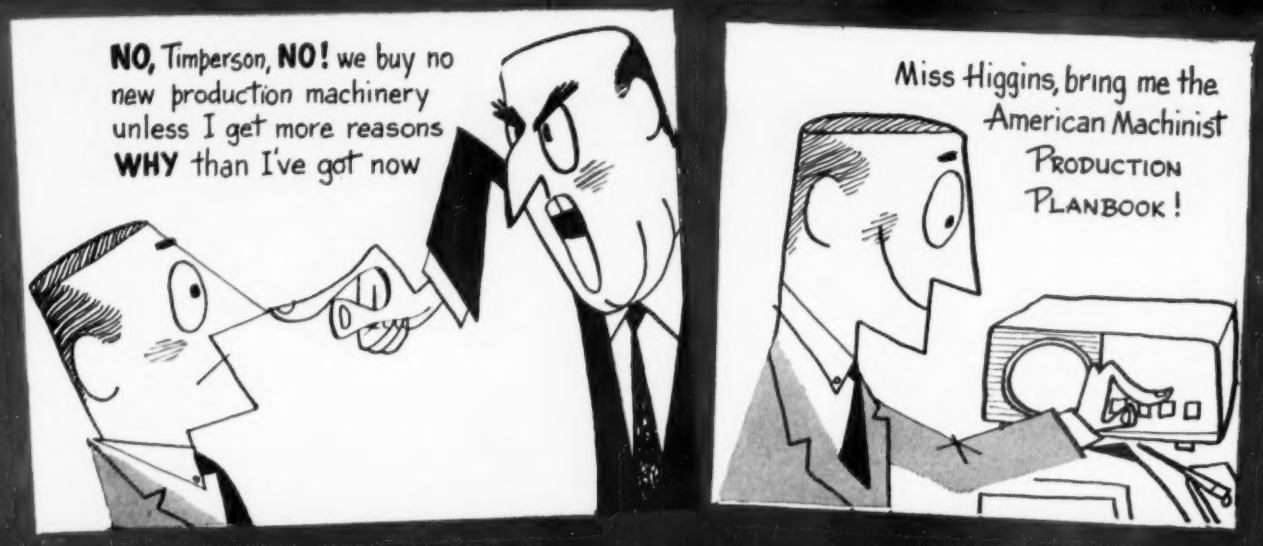
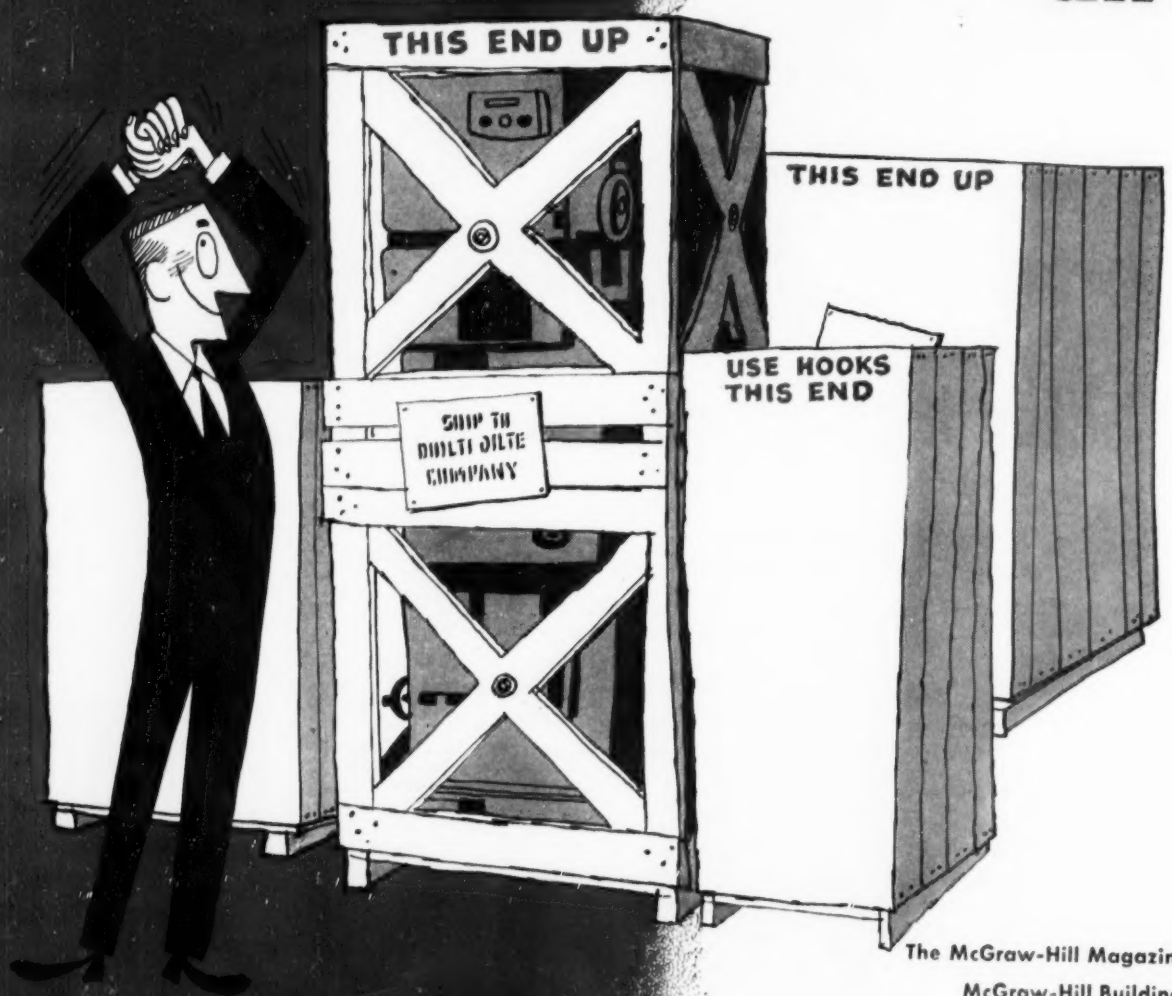

NO, Timperson, NO! we buy no new production machinery unless I get more reasons WHY than I've got now
Miss Higgins, bring me the American Machinist PRODUCTION PLANBOOK!

all . .



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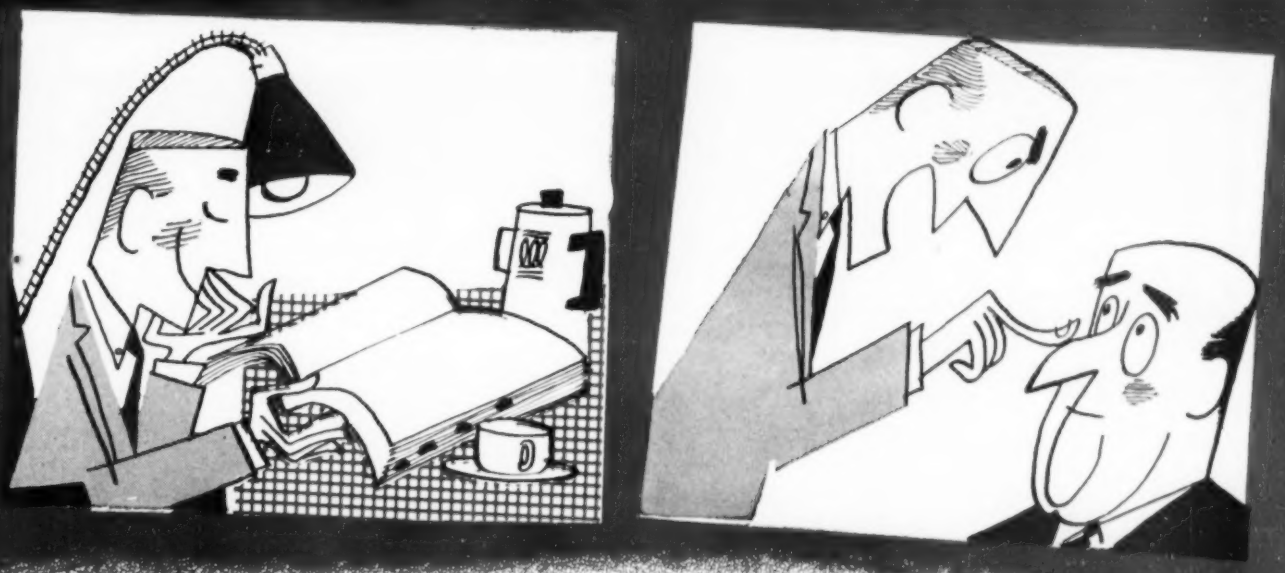

. . . the facts you need

. . . to plan a farsighted machinery and equipment replacement program for your production shops . . . and to back this program up with solid evidence of *why* it is a sound investment for your company . . . are coming your way in Mid-November.

Featured in *American Machinist's* 1954 PRODUCTION PLANBOOK for Metalworking: a new nation-wide Inventory of Metalworking Production Equipment . . . How to Plan for Profitable Machinery and Equipment Replacement . . . Case Histories of Successful Modernization Programs.

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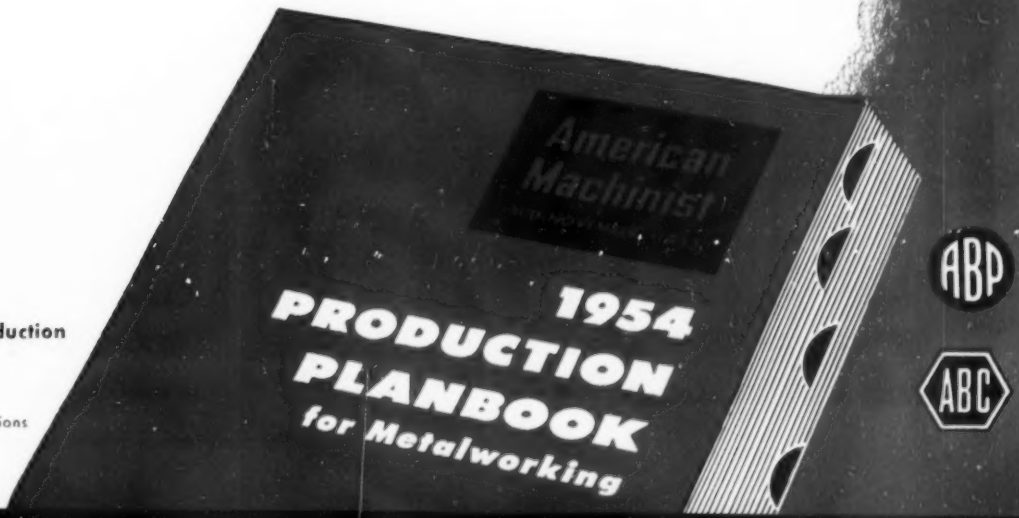

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TEE BOLTS

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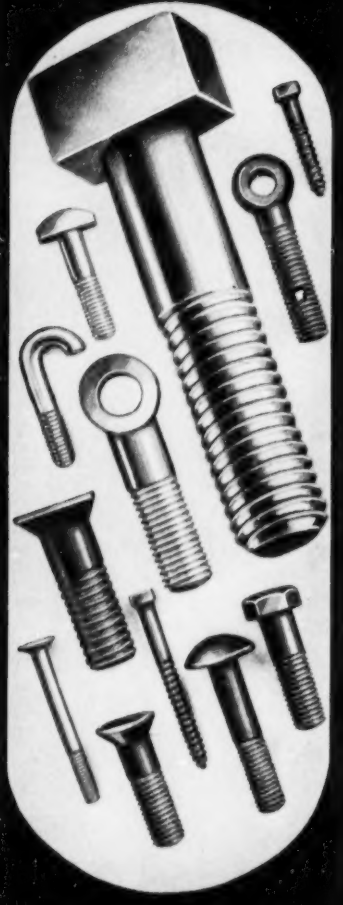

Among Pawtucket's many specialty products, these lower-cost tee-head bolts are the leaders in this field. Pawtucket's exclusive production method keeps cost low, dimensional accuracy unusually high and strength above standard.

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THE PLACE TO SOLVE YOUR BOLT PROBLEMS

T. M. REG.

ment under them and because their job is vital to the company they are, from necessity, bypassed. It is too bad and yet isn't it the supervisor's job to make himself ready for advancement? It certainly is. Training of replacements for the job is part of a supervisor's responsibility. If you are a good foreman, you already have done this. If you are afraid of your job then you haven't. Look yourself in the eye and think why you haven't brought along someone so that you can be advanced in the company.

Now let's consider problem two—advancement. This problem faces all of us. It is not confined to supervisors alone. Should we stay with one company and take all the breaks that may come, or should we force the breaks. Each individual has to answer those questions for himself. Naturally no two of us are exactly alike. We all have mental quirks that make us react differently. This is a good thing, for if we all want to do the same thing, certainly this would be a more complex world than we now live in.

The best advice is that as one progresses in the field of labor he stop occasionally and take account of stock. Analyze your position. Why are you at that step or how did you get this far. If you can find a clue to your success or failure to get ahead then use or change, as the case may be, your approach to the subject of advancement. Each of us has to make a living. Some are able to breeze through life without a problem, living on the fat of the land but not always happy. Others of us from force of necessity, stay put on an irksome job. Perhaps a change would be better.

So the question of whether to stay with a company for a lifetime hoping for and sometimes getting small advancements, or whether to change

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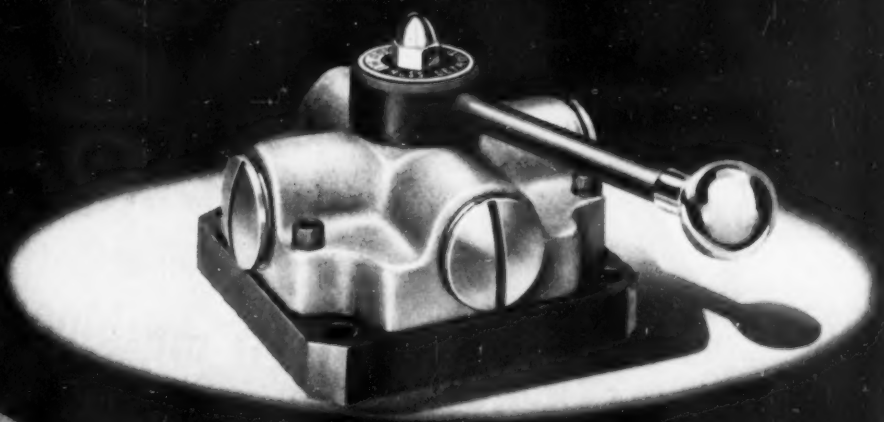
IT'S FOR MACHINE TOOLS . . .

it's a "pancake"—2" high



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- Easy to operate
- Smartly styled, clean and neat in appearance
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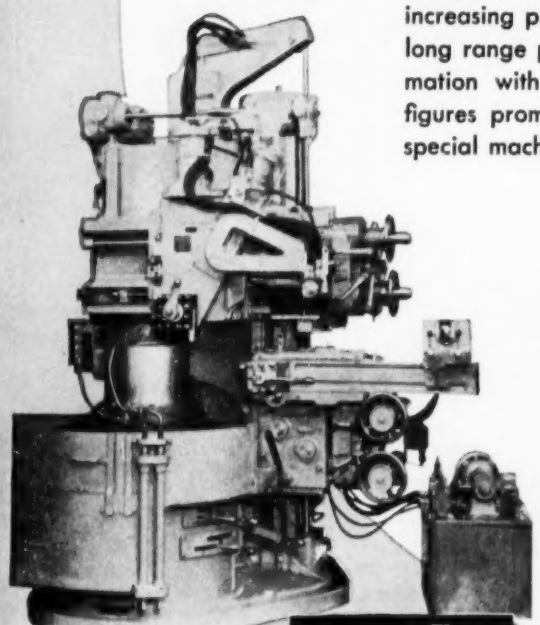
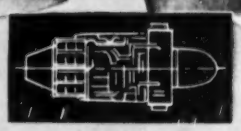
HAS WHAT INDUSTRY NEEDS IN THE TREND TO *Automation*

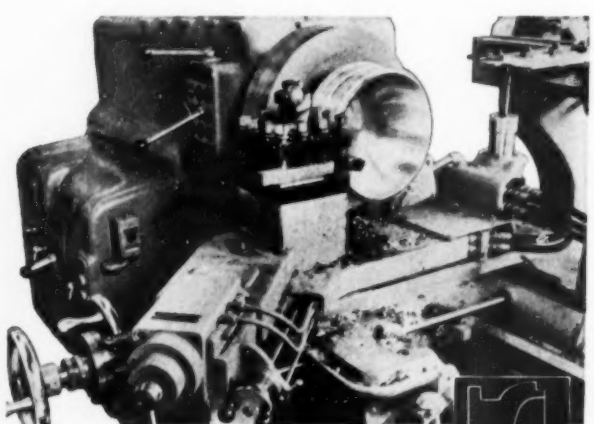
with TRACER-CONTROLLED machine tools

Across the nation, management men recognize the urgent need for increasing production, improving quality and lowering costs. These long range planners are getting a head start in the trend to automation with tracer-controlled machine tools. Turchan equipment figures prominently in the efficiency of automatizing standard or special machines, regardless of make, model or size.





Turchan integral affords contour turning and boring of greater height and depth of jet engine parts.

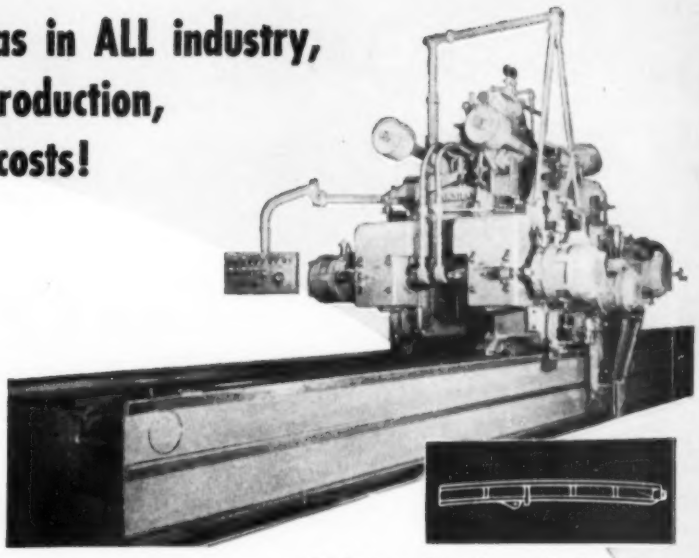


Intricate air tank head completely turned by Turchan compound lathe attachment in one-third time required by former method.

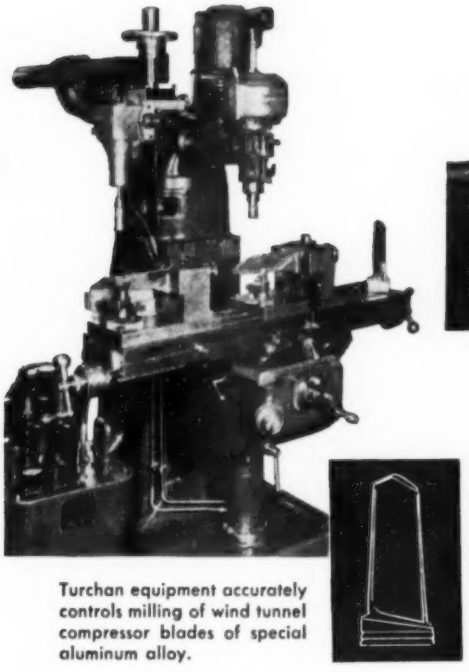
TURCHAN FOLLOWER

8259 LIVERNOIS AVENUE

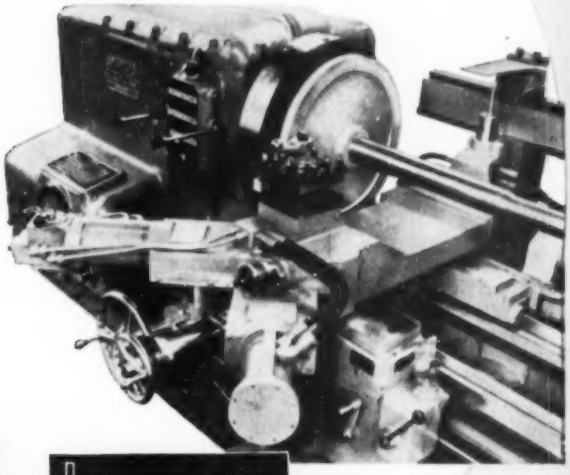
In the aircraft industry, as in ALL industry, tracer-controls increase production, improve quality and cut costs!



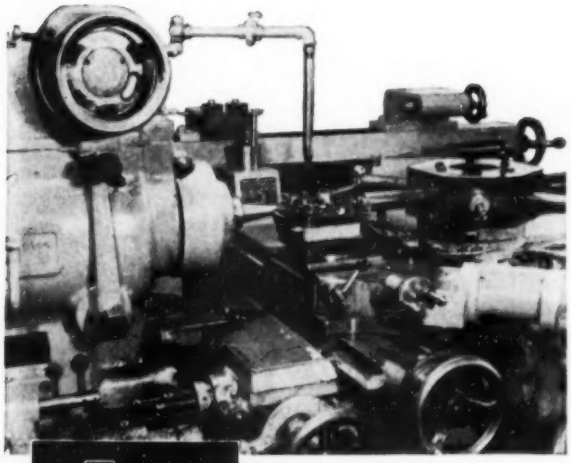
Production milling of spars by Turchan tracer-controlled equipment assures accuracy beyond that of human skill.



Turchan equipment accurately controls milling of wind tunnel compressor blades of special aluminum alloy.



Turchan dual slide follower-equipped lathe allows turning and facing of Turbo-jet wheel shafts in one set-up.



Turchan-equipped turret lathe machines difficult contours from either round or flat template within ± .001" variation.

Investigate what Turchan can do for you — send sketch and specifications for job analysis and full information.

OLDEST MANUFACTURER OF
TRACER-CONTROLS FOR MACHINE TOOLS

MACHINE COMPANY
DETROIT 4, MICHIGAN

ENGINEERED and MANUFACTURED AS A PRECISE TOOL

ENTIRE CHUCK BODY HARDENED INSIDE and OUT... TAPERED CHUCK BORES HARDENED AND GROUND TO CLOSE TOLERANCES

SUPREME Brand CHUCKS are expertly engineered to give top performance in the field. Jaws are of nickel chrome moly alloy steel expertly heat treated . . . key holes do not extend into body cavity thereby sealing out dirt . . . entire chuck is hardened inside and out . . . one piece geared nut construction. Careful precision manufacturing produces a chuck that gives long trouble-free service in the field.

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SUPREME BRAND CHUCKS

Supreme Products, Inc., 2222 South Calumet Avenue, Chicago, Illinois

THE CHUCK THAT LIVES UP TO ITS NAME... SUPREME

positions and thereby advance more rapidly must depend upon the make-up of the individual.

Remember, to move from one job to another indicates to many that you are a rolling stone. Always make advancement — never just a job change or a swap of positions. Yet, again, it is your life and you must make your own decisions—have to answer only to yourself and your own need for happiness.

Don't let antiquated thinking handicap your abilities. We need in this country more people who work willingly for the things they want, rather than just merely to get ahead by sitting back and receiving everything for nothing. Conclusion: First, train your own replacement; it can help you get ahead. Second, make advancements based on your own concept of living. Be happy in what you do.

Charles D Townsend
West Hartford, Conn

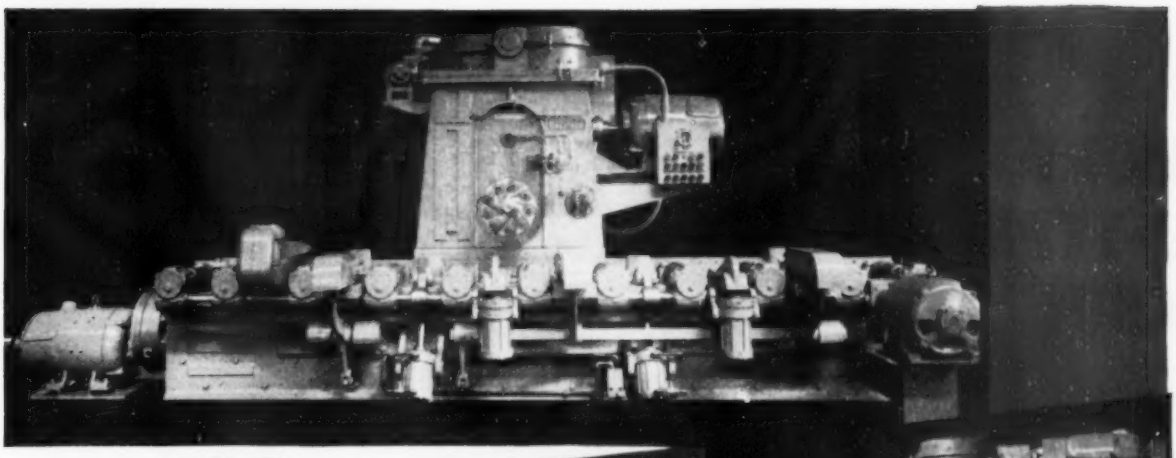
•

THE QUESTION whether a company can ask loyalty of its foremen to the point that they make arrangements for their successors would not have to be raised where management has developed organization charts and procedures to designate the proper persons who are to be given special training preparatory to taking over top positions when changes and vacancies occur.

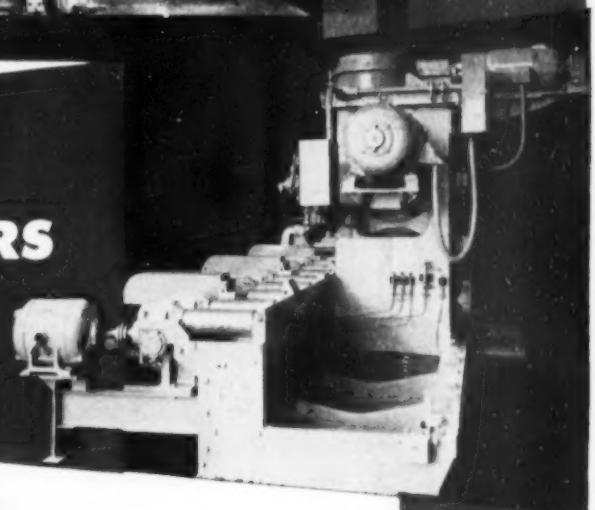
When any persons in an organization are promoted to new responsibilities or when executives and supervisors leave, it is important to have on hand replacements who have been acting in the capacity of understudies. By having a well-developed plan of understudy arrangements, the management avoids getting into a pinched situation when faced with expansion or large orders, or unexpected vacancies in its supervisory staff.

In the ranks of workmen, there are many persons who can be selected and elevated to become supervisors, and among the supervisors

"Production has certainly speeded up since that efficiency expert isn't around to take up our time showing us how to speed up production."



15 Century MOTORS PROVIDE THE "MUSCLE"



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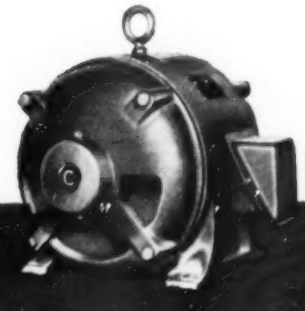
The power to skin "52100" high-chrome steel billets at the rate of 2900 sq. in. per hour flows smoothly from a coordinated combination of 15 rugged Century motors on this massive machine.

Here is another example of how leading manufacturers depend on Century motors to bring out the best performance in metal-working equipment. You'll find it worthwhile to follow their example and specify Century motors on all your equipment. Your nearby Century district sales office or Century distributor will be glad to give you more information.



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-799

CENTURY ELECTRIC COMPANY
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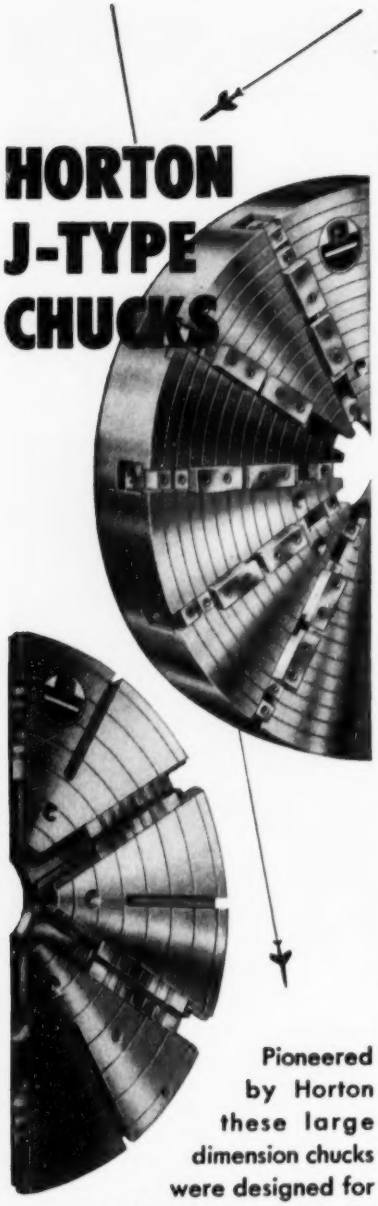
Century C MOTORS

HORTON J-TYPE CHUCKS



Pioneered by Horton these large dimension chucks were designed for the aircraft industry especially for machining various jet engine parts.

For 102 years Horton Chucks have kept pace with industry's demands.

HORTON CHUCK
Since 1851
DIVISION OF
THE E. HORTON & SON CO.
WINDSOR LOCKS, CONN.

and department heads there are many who have the capacities for taking full charge of new departments, new plants, or to assume functions of new jobs that are created. Development by management of replacement plans preparatory to personnel changes is the wisest course to follow instead of depending on the supervisors themselves to groom successors.

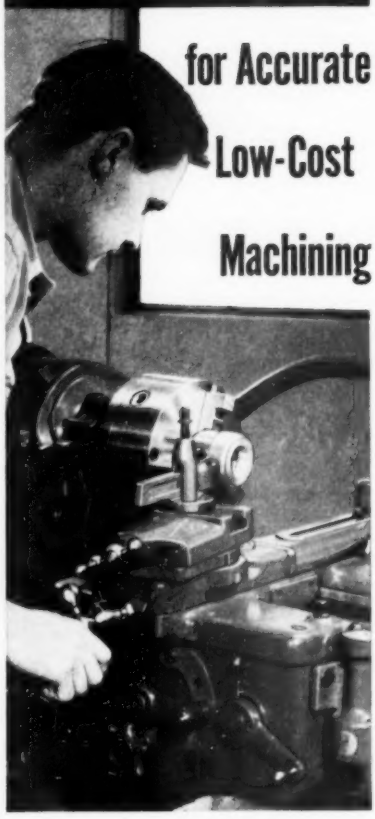
"Frailty, thy name is man" is an axiom whose message should be given serious consideration in setting up and maintaining an organization. The unpredictable changes in the state of human affairs make it necessary for management to look ahead in providing and assuring for the continuity of availability of key men in its setup. A "number one" man requires a complementary "number two" man to provide continuous successful operation of the plant. A substitute for each executive within the organization is essential. This substitute must be available to act in case of illness or other cause of absence of the supervisor, or in the event of his leaving the employ of the company. In order to assure the understudy's ability to take over, management should have definite and developed plans leading to proper selection and prior training of the understudy.

In the industrial army, as in the fighting army, the company without a head seldom reaches the objective. If there be always a capable substitute, it will always be possible to have a head for the shop or department. However, if a plan of substitutes for supervisors is being developed by the company, it is essential that all members of the organization have complete confidence in the purpose behind the plan. If they gain the feeling that the plan is merely a club to be held over their heads, so that if they do not prove successful at any time they can easily be removed, the plan will fail.

Although the desirability of having

"Could we have a little less yackity yack? The Cubs has got two men on and Kiner's up!"

SOUTH BEND 13" LATHES for Accurate Low-Cost Machining



You can reduce costs in your shop by using equipment that will assure accurate and efficient production. Modern in design and built with extreme care, South Bend 13" Lathes are fast, accurate, and versatile. They have many improvements and refinements that will make your most difficult lathe jobs easier.

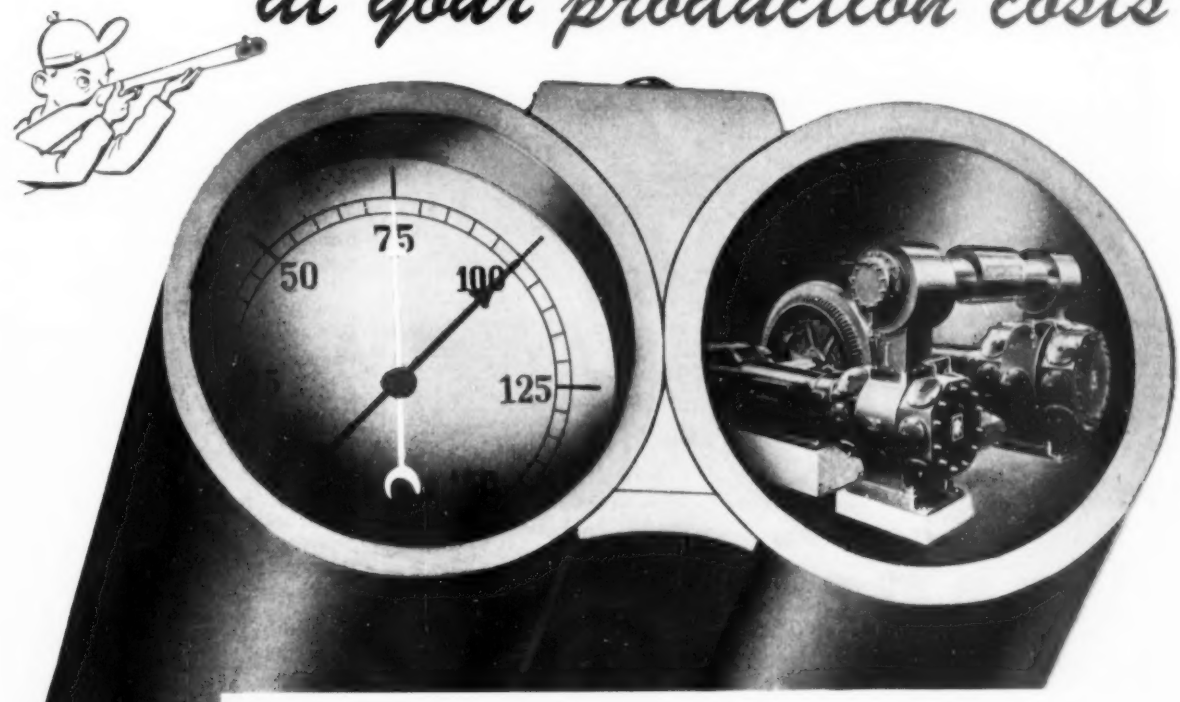
Write for complete information on South Bend Lathes, Drill Presses and Shapers.

SPECIFICATIONS

- **Swing** — 13⅛" over bed
- **Center Distances** — 16" to 52"
- **Collet Capacity** — 1"
- **Spindle Speeds** — (8), 40 to 940 r.p.m.
- **Cross and Longitudinal Power Feeds** — 48 each
- **Thread Cutting** — 48 R. H. or L. H. pitches . . . 4 to 224 per inch

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906

Fire this DOUBLE BARREL *at your production costs*



1 FULL AIR PRESSURE

Many plants are choking their production and their profits by operating Air Tools on insufficient air pressure. A seemingly small pressure drop of 10 pounds per square inch may cut a tool's productive power as much as 15 to 25%.

Industry is installing new and more Air Tools to reduce its production costs. Why not give these Air Tools a chance to give maximum performance? An I-R engineer will help you make a pressure check . . at the tools. If it's low, perhaps just a change of piping will correct it larger pipe, or more direct, or new feeder lines. Or possibly you may need more compressor capacity. . at the main plant or at booster stations.

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If you need a new compressor, you will want the *best*. Ingersoll-Rand's "PRE" synchronous-motor-driven compressor (shown above) is the kind of machine that any plant engineer would be happy to operate . . any company proud to own. These compressors are full of valuable features that you cannot buy in any other compressor ... features that save power, save maintenance. You can't afford to over-look the "PRE" in any modernization program.

"PRE" sizes range from 400 to 3000 horsepower, and if you need smaller compressors, or another type of drive, Ingersoll-Rand has it . . . whatever it is.

Ingersoll-Rand also builds a full line of Air Tools, Air Hoists, and Rock Drills for both production and maintenance work. And remember, Air-Power equipment pays for itself nearly twice as fast today.

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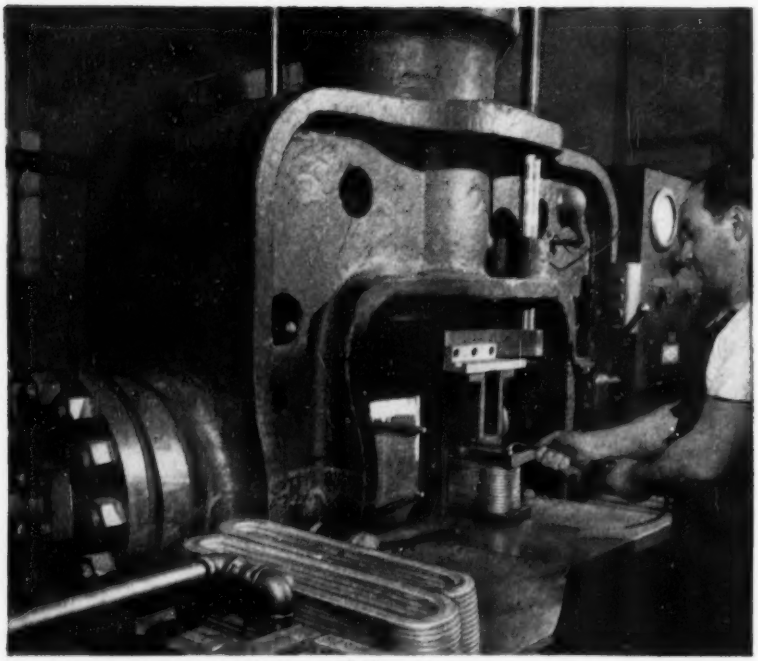

How this 2-way

FARQUHAR Hydraulic Press

forms motor and generator coils

In producing motor and generator coils from ¼ x 1-in. copper stock, the stock is first bent and the ends laminated, and then pressed to restore them to their original thickness. Then, the coil is put in this Farquhar 2-way Hydraulic Press for "pressing" the form.

The coil is laid on a steel block, a three-part filler mandrel inserted, and a top block applied. The press "snugs" the coil sides at low pressure (40 tons); then the vertical ram snugs the top. The operator kicks the pressure-shift pedal, to double vertical-ram pressure for forming.

Capacities of rams are 100 tons horizontally and 200 tons vertically. Illustration above shows operator withdrawing the coil after forming has been completed.

Farquhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the-job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Their expert assistance is yours for the asking. Give them a call . . . at no obligation, of course!

Or, send for our free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: THE OLIVER CORPORATION, A.B Farquhar Division, *Hydraulic Press Dept.*, 1506 Duke St., York, Pa.

Farquhar
HYDRAULIC PRESSES
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management in full charge of the understudy program is generally recognized, it is not always possible to pick the proper understudy. In this respect, the foreman or supervisor concerned can give management valuable aid in selection of the proper subordinate to understudy his job. In the opinion of some management men, the foreman has the first responsibility in picking his chief assistant who will also be his understudy.

However, it is my belief that management should work with the foreman to make certain that the second man is the right man.. The foreman should welcome the aid and advice of management in helping to pick the understudy. There is also this advantage in having a capable understudy: it will leave the foreman free to give more time and thought to his administrative functions while delegating some of his authority and details of work to him. Where a capable assistant is on hand the foreman may accept another position or promotion with a clear conscience in the knowledge that his replacement will carry on efficiently.

On the other hand, where no understudy has been selected, and the need suddenly arises for filling a vacancy, an unqualified man may be appointed with resultant deleterious effect on plant operation.

A procedure that entails the rotation of subordinate supervisors or understudies by placing different ones in charge of the department during the foreman's absence is the best method. By adhering to this rotation plan, management as well as supervisor will have a better opportunity for judging the administrative ability and capacity of each potential supervisor or understudy, which will lead eventually to the selection of the best man for replacement when it becomes necessary.

In one plant of which I have knowledge, the procedure of rotation of potential foreman replacements was not followed. In lieu of rotation, management and foreman picked a likely candidate for understudy and groomed him for the possible contingency of filling the supervisor's position should the occasion arise. The reasoning in back of this plan was that it was believed that rotation of understudy material would result in confusion when different aides would take over at different times, and that it was much better to appoint a specific aide for a designated foreman at once. In this manner, when the foreman was absent, his workers would know who was

in charge and have no hesitation or confused thinking as to who would issue the orders and supervise them. This procedure would also avoid the rivalry that might exist between subordinate supervisors under the rotation plan who might fail to cooperate with one another as long as they felt they were rivals for the same job.

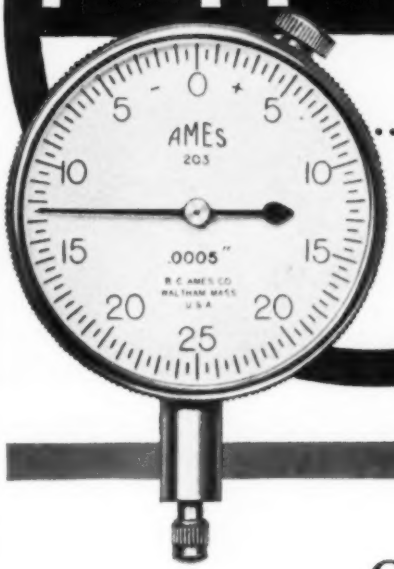
Management and the foreman can determine together the necessary capabilities and qualities that must be possessed by the potential replacement for the foreman and analyze each prospect to see how he rates in them. The foreman in his daily contact with the understudy should report to the front office how the potential supervisor is standing up under the duties of foreman's assistant. Whether the understudy possesses the qualities of leadership, intelligence, integrity, fairness, loyalty, knowledge of work, will soon become apparent.

The importance of making a proper choice for possible replacement material in the understudy is therefore of concern to the present foreman as well as management. For the foreman, a good replacement choice may have a direct bearing on his own successful promotion to a higher position with the company on the grounds of having a capable man available to take over his present position when the time comes. For management, it may mean the assurance of efficient operation of a department should unforeseen changes occur in the supervisory section of the department.

If a company is to meet the need for effective supervisory replacements, it is up to it to develop such replacements by good selection of

"The foreman gave me that raise — I told him I had four more mouths to feed."

AMES



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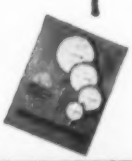

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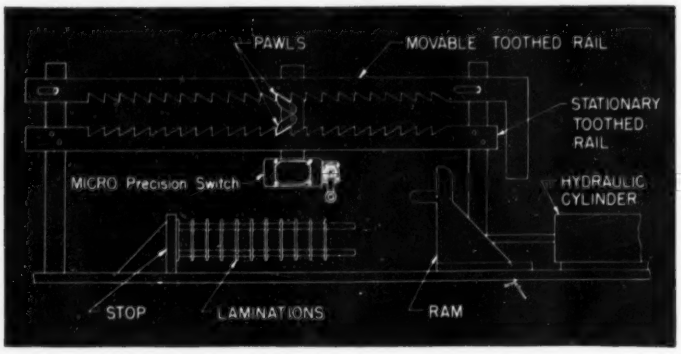
MICRO heavy duty limit switch makes accurate coil building an automatic job



• Spacing of laminations is done automatically on this coil building machine by use of a MICRO heavy duty limit switch.

1 The ram pushes laminations on tubes until contact is made with the limit switch.

2 When the switch is operated it trips a four-way solenoid valve which reverses the flow of oil in a hydraulic valve, forcing the ram to return.

3 When the ram reaches the end of its return travel, an arm on the ram causes the switch assembly to move back one notch . . . ready for the next operation.

This is another of the thousands of uses plant engineers and maintenance men are making of MICRO switches as limits, safeties and interlocks on every type of plant equipment. It is easy to make machinery safer and more productive through the use of MICRO switches. There is an authorized MICRO distributor near you with a wide variety of switches to meet your specific needs. Look in your classified telephone directory under "Switches, Electric."

MICRO MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS
A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

the raw material and by adequate processing of the understudy through a thorough program of training. In some plants, only half-hearted efforts are made to develop qualities of leadership that are necessary in prospective foremen. Usually when a new foreman is necessary, a group of employees are lined up and one of them is chosen with the most seniority, or best production record, or some personal reason by the selector. When this kind of cursory consideration is given to a foreman's appointment, is it any wonder that later on this haphazard manner of selection results in poor employee relations, high turnover, low production, and high scrap loss?

To get effective leadership material in replacement candidates consideration must be given to the raw material selected for processing. Management must know precise job requirements, then ferret out through testing and interviewing, the qualifications necessary to meet these requirements. Once the selection has been made, the job becomes one of development. The key to this development is a comprehensive program of training and education. The aim should be development of the whole man, not job performance alone. Either through the rotation plan of understudy for different foremen or through appointment as aide for one particular foreman, management can help develop a suitable subordinate who can take over when the occasion arises.

To paraphrase an age-old maxim on foresight: "If a company takes no thought about what is distant, or neglects to insure against emergencies, it will find trouble near at hand." If a company lacks the foresight to prepare suitable replacements for emergencies caused by unexpected loss of its supervisors it has only itself to blame for the subsequent trouble that accompanies improper supervision.

Harry Kaufman
Philadelphia, Pa

"Honest Mr. Morgan, I didn't mean to let it slip about me making more money than he does."

POP'S school of Filing

NOW SEE IF YOU C'N LEARN TO HANDLE THAT JOB!
THAT'S CON FOOSHIUS, POP'S NEW HELPEROUTER!
POP'S TRIED 'IM ON NINE DIFFEREN' JOBS IN NINE DAYS!
HE'S SURE CONFOOZLED ON WOT'S TH' RIGHT FILE F'R TH' JOB!
STAN RANDALL

THE "language of files and filing" is a necessary part of every good mechanic's education—whether he is "majoring" in a specialized type of operation or is assigned to miscellaneous work around the shop. The days of haphazard file selection and filing techniques are gone in modern shop practices. Parts finishing, assembling and fitting must take into account diversity of metals, degree of accuracy—and the speed necessary to keep production costs within bounds.

Nicholson file engineers study all these factors and design files with tooth shapes, angles, sharpness and hardness to fit specific metals, methods and end results. With Nicholson, making files is a *science*.

If your Industrial Distributor handles Nicholson or Black Diamond brand files, he is well equipped to give your production heads helpful technical suggestions.

ABOVE—The Nicholson (or Black Diamond) Long Angle Lathe File. While the ordinary Mill file is normally capable of doing good lathe filing, the Long Angle Lathe file—with teeth angle increased to 45°—does faster and smoother work. The chips slide down the longer angle and there is less tendency of "pinning up" and scratching surface being smoothed.

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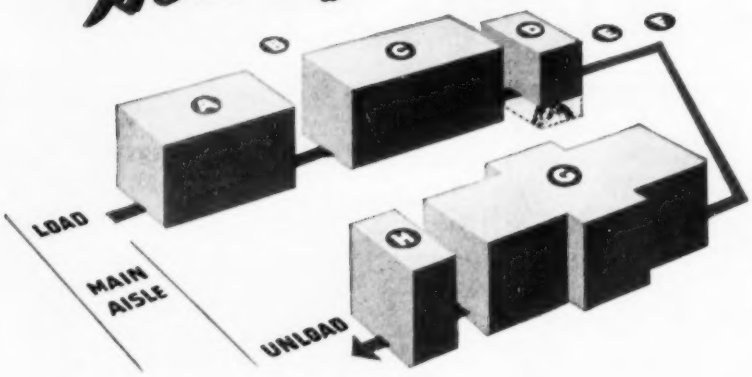
Heat Treat Furnace Layout by Holcroft... 1st of a Series



- A Direct gas-fired normalizing furnace
- B Controlled cooling zone
- C Direct gas-fired hardening furnace
- D Quench tank and elevator for oil or water
- E Drain section
- F Transfer (and tip over) from drain section to draw furnace
- G Indirect gas-fired draw furnace
- H Tip-over at discharge end of draw furnace

"Pinch-Hit" Unit backs up 5 Heat Treat Furnaces...

A new furnace layout—designed to bat for five existing furnaces—handles overflow production, replaces any furnace down for repairs, and has the extra capacity for treating war-production forgings of special alloy steels.

Designed by Holcroft, the unit as laid out above, is the buffer behind existing furnaces which normalize, anneal, harden-quench-draw, normalize-harden-quench-draw, or cycle anneal the forging production. A "U-type" layout puts both charge and discharge ends of the unit on a main trucking aisle to simplify material routing.

This is custom engineering at its finest—the type that studies *your* problem and develops the right furnace, or combination of furnaces, for the job. Cost? Let's be realistic: more, perhaps, for a Holcroft furnace—*but much, much less per heat-treated piece.* Write today for more information. Holcroft & Company, 6545 Epworth, Detroit 10, Michigan.

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RUSTY

Does a man lose touch—become rusty—away from his trade? Should you hire back an ex-toolmaker who hasn't been at the job for the last ten years? Here's what readers think . . .

IN THESE DAYS of special skills any toolroom should be glad to get their hands on a good toolmaker. Toolmakers who leave their trade for several years usually do so for a better position and related skills. Many toolmakers become designers, head up inspection departments or become supervisors. The old-time toolmaker knows his way around. He does not let the little things hold up the job. He knows all the little tricks to keep the machines running.

The modern toolmaker works to a blueprint. If anything else develops he looks for the boss, electrician or maintenance man. Anything but the building of tools, dies, or fixtures is the electrician's or maintenance man's job. I have seen toolmakers standing around waiting for an electrician to come change a fuze or some other minor repair. Have also seen them send for a machinist to do a five-minute job.

I am not claiming that the modern toolmakers are not as clever as the oldtimer; I do claim they are only half awake to their physical and mental resources. They don't want to do anything not on a blueprint. They don't even want to think for themselves. They are quite satisfied to let the boss, engineer, electrician, or maintenance do all the work and worry.

Although I worked as a toolmaker for several years, I have also been in the management picture. I can see both angles. On two different occasions I left the management team to go back to toolmaking after several years' absence. Aside from be-

"Imagine our founder seeing this budget—he'd turn over in his grave."

New up-to-date machine for high production stretch-wrap forming!

HUFFORD

MODEL A-7

CAPACITY: 20 TONS

Incorporating the latest engineering developments, this new Model A-7 Hufford provides *semi-automatic* operation in a low tonnage machine. It insures considerably higher output than older, manual models of a similar tonnage range and offers, in addition, increased forming versatility with *independent* arm actuation.

FEATURES

SEMI-AUTOMATIC OPERATION—Stretch pressures, wrapping speed and arm positions are pre-set for any given workpiece. These factors are uniformly duplicated on each work cycle.

GREATER UNIFORMITY OF PARTS—with semi-automatic operation all human variations, normally affecting part uniformity, are eliminated.

NO SPECIAL OPERATING SKILL—Once machine functions are properly established, no special skill is required to produce excellent parts.

FEWER LOSSES—Work breakage from over-stretching is virtually eliminated on production runs.

INDEPENDENT ARM ACTUATION—Each arm is under independent control, simplifying setups on non-symmetrical dies and adding to forming versatility.

The Model A-7 is the ideal machine for modernizing your stretch-press department. Write for quotation!

Put the Model A-7 to work forming parts like these!

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Machine Works Inc.
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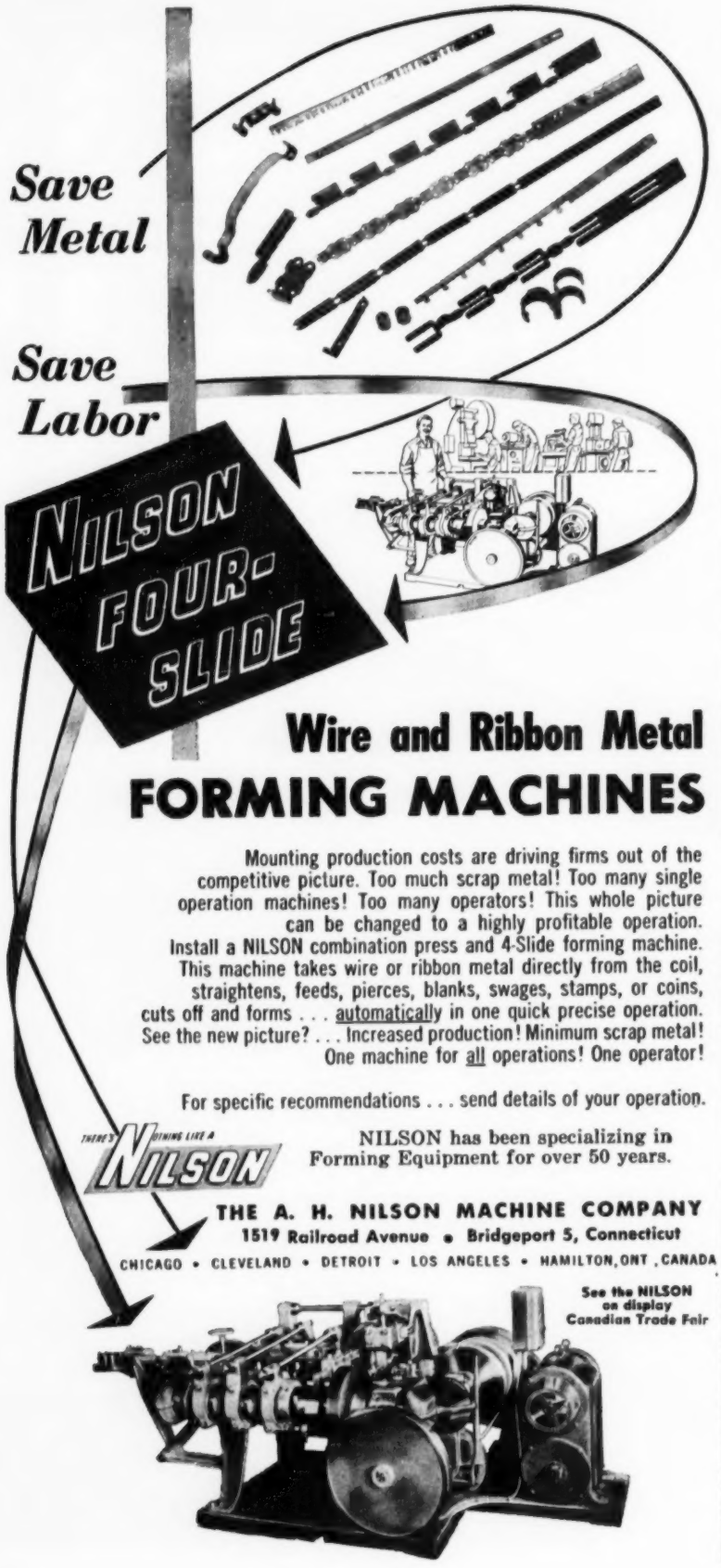
Manufacturers of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Mounting production costs are driving firms out of the competitive picture. Too much scrap metal! Too many single operation machines! Too many operators! This whole picture can be changed to a highly profitable operation. Install a NILSON combination press and 4-Slide forming machine. This machine takes wire or ribbon metal directly from the coil, straightens, feeds, pierces, blanks, swages, stamps, or coins, cuts off and forms . . . automatically in one quick precise operation. See the new picture? . . . Increased production! Minimum scrap metal! One machine for all operations! One operator!
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ing a little rusty, I experienced no difficulty.

My varied experiences have convinced me that hard work is the secret of success. If we work hard we become clever. If we continually depend on the other fellow to supply all the answers, we fail. The swimmer does not forget how to swim and the toolmaker does not forget how to make tools, dies, or fixtures.

A E Salmons
Philadelphia, Pa.

IF MR RUSTY, who was turned down by Ed because he had not worked at toolmaking for ten years, was a reasonably bright guy, Ed probably did his firm a disservice by failing to hire him.

While Ed did not say what sort of work the man had been doing during his ten-year vacation from the toolroom, the chances are that he had been in touch with some kind of machine work. If so, he probably picked up a lot of new ideas about *using* tools, if not about making them. It is quite possible that he may have seen some new notions about making tools as well.

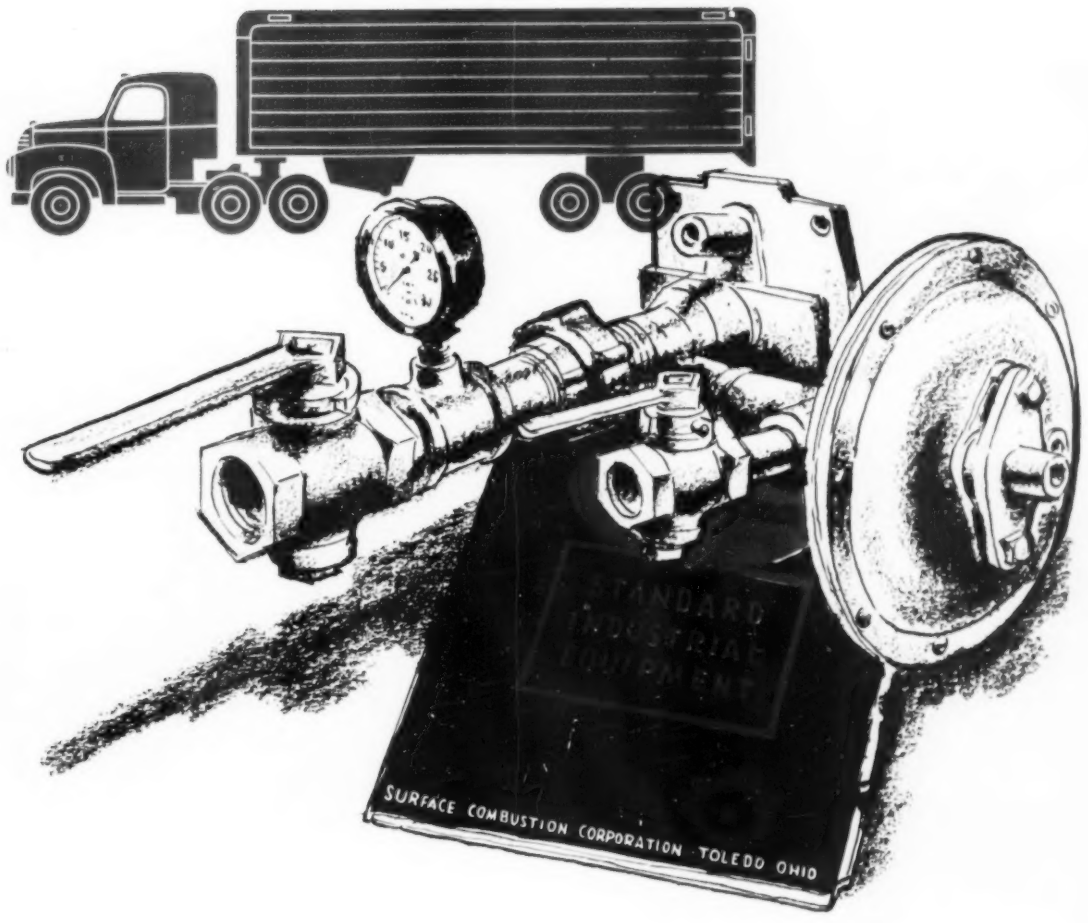
If Mr Rusty has been in any sort of mechanical work he will have seen new tools and new methods that might easily be of value in Ed's department. If he had thorough grounding in the principles of machine work, any experience in other lines should be of value when he went back to his old job, toolmaking.

While he might have temporarily lost some of his speed, that would come back in a short time. But speed is only one of the factors that makes a toolmaker of value to his firm. With the right fundamental training, which Ed must have given him, perhaps the ten years' absence might possibly have made him see some of the mistakes that had been built up during his previous term of service.

Fred H Colvin
Point Pleasant, NJ

"Who's the wise guy!"

it would take a highway freighter...



to carry just one each of the 80 types and 800 sizes of Surface Combustion burner equipment! That's quite a load. It represents a wealth of combustion research and field experience with every kind of heat treating and heating application. It's a load of cost savings, too, resulting from high burner efficiency, easy installation and maintenance, simple and precise control, versatile combinations. You can take your pick from the load and find the burner equipment to meet your requirements. Write for Literature Group H53-10.

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HANCHETT
FOR ALL METAL CUTTING

knife grinders for **shear blades** *and* **knives**

MAMMOTH CONSTRUCTION precision built for greatest accuracy, finest finishes — plus high production

MECHANICAL or HYDRAULIC TRANSMISSION

MODEL AK

SPEEDS — *10' to 100'*
30' to 150' and faster.
MOTORS — *7½hp. to 40 hp.*
WEIGHTS — *10 tons up to 40 tons.*
CAPACITY — *84" to 360" and longer.*
Mechanical or hydraulic head carriage drive for flat or concave bevel grinding.

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•

1952 BOOK OF ASTM STANDARDS. *7 vol. Published by The American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa. 9975 pages, 2001 standards, specifications and tests. Prices: cloth binding—Parts 1, 3, 6 are $12 each; Parts 2, 4, 5 and 7 are $10 each; price of complete set, $76.*

Some idea of the importance of these ASTM Standards to industry in respect to purchasing materials and evaluating their quality through standard tests can be gained from statistics on the growth of the "Book". In 1939 there were 866 standards; now there are 2001. Then, the work consisted of 3700 pages; the current compilation has 9975 pages. Because of the great mass of material collected and approved by technical committees, the data have been assembled in seven volumes. Three of these are reviewed below:

PART 1—FERROUS MATERIALS. This book is the most widely distributed part of the ASTM Standards. It contains 1602 pages, 291 specifications and tests, of which 209 relate to steel and steel products. For example, if you buy steel tubes, you find the proper specification from among the 19 listed. Your specification (say for seamless and welded stainless steel tubing to general service) will have the designation A 268-47. Reference to the proper pages in the book will supply 5 pages on the grades of material, their chemical requirements, physical properties, tests, finish, and inspection. If these requirements fit

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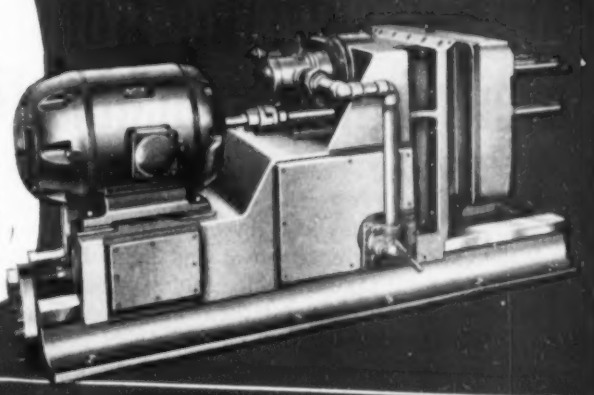

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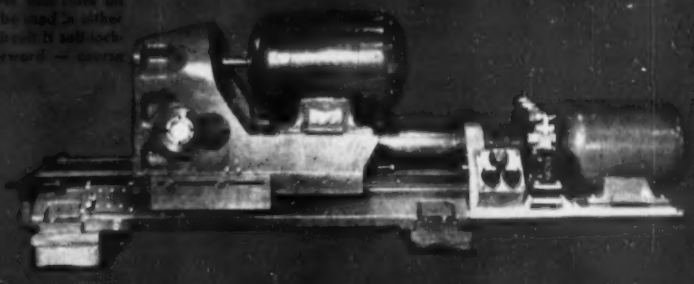

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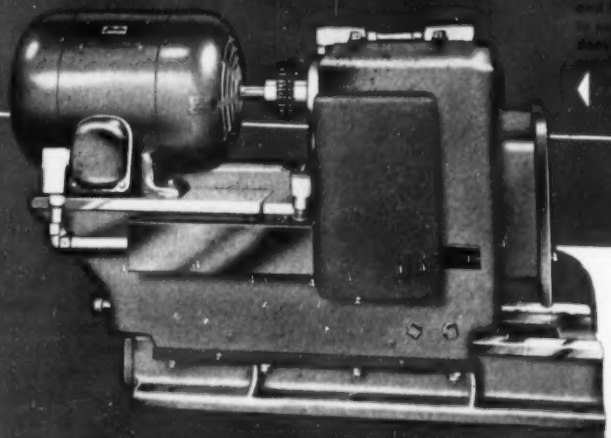

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•

DIE GEOMETRISCHEN VERHALTNISSE BEI DER HERSTELLUNG UNREGELMASSIGER FLACHEM. GEOMETRISCHE ERZEUGUNG UND NACHFORMVERFAHREN. (GEOMETRIC RELATIONS IN THE MACHINING OF IRREGULAR SURFACES. GEOMETRIC GENERATION AND METHODS OF REPRODUCTION)—*By W H Gres. Published by Springer Verlag, Reichpietschufer 20, Berlin W35, Germany. 95 pages, 6½x9¼, Price 12 DM.*

This book deals with the kinematic geometry of profiling machines in which the cutting tool is guided either by a kinematic chain or by a tracer following a master surface. Methods of duplicating a master surface occupy the major part of the book, and the numerous mechanisms that can be used for this purpose are classified and schematically illustrated. Some are described which intentionally produce a distortion of the master surface.

First, a sharp-pointed tracer and reproduction by a single, sharp-pointed tool are studied. This is followed by a discussion of commercial tools and corresponding tracers. In the use of commercial tools, the theory of equidistant curves is given. Limits of duplication are studied.

The rest of the book is taken up with a discussion of kinematically generating profiles, such as straight lines, circular arcs, cycloids, sine curves, and the innumerable curves described by points in the connecting

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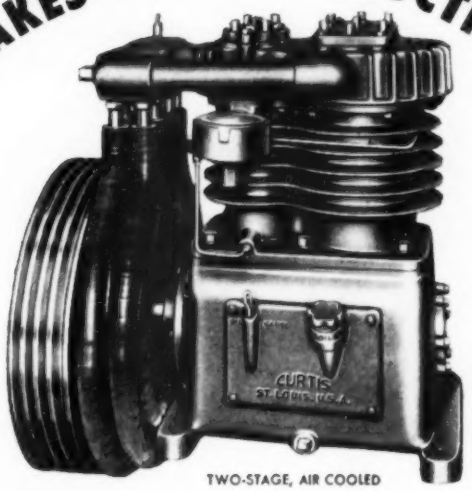

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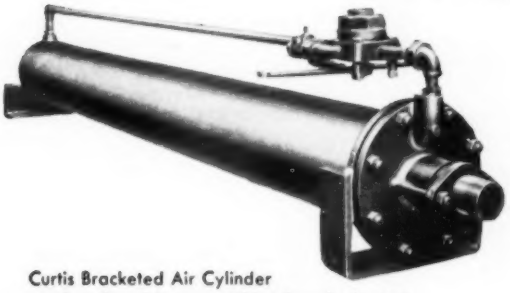

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rod of a four-link chain. Pair closure and force closure are mentioned. The geometry of non-planar curves and their generation are discussed and examples given. This part of the book is too sketchy and may well be revised in a later edition.

Generally speaking, the author has been highly successful in presenting to the design engineer the kinematics of automatic profiling machines, including die sinkers. To avoid disappointment, however, it should be mentioned that the book deals with geometry only, and leaves the machine design features to be worked out by the design engineer.

Type and illustrations are excellent.—*Reviewed by W Trinks*

•

REVIEW OF CURRENT RESEARCH AND DIRECTORY OF MEMBER INSTITUTIONS *(1953)—Compiled by Engrg College Research Council, ASEE. Published by V E Neilly, secretary, Engrg College Research Council, 103 Mech Engrg, The Penna State College, State College, Penna. 330 pages, 6 x 9 in. Paper covers. Price $2.50.*

This biennial volume (previous editions: '47, '49, '51) shows about 7500 research projects under way at 103 institutions, all members of the ECRC (includes all major engineering colleges of the US). Some 13,000 people are engaged in the work, spending about $65 million annually. Included are subjects of 5000 projects, names of administrative officers, policies, governing projects, sources of income, and other related subjects. If your job includes development work, this handbook is essential.

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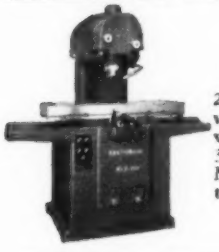

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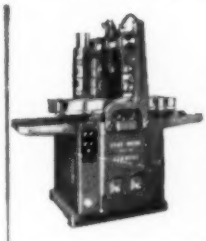

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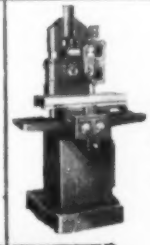

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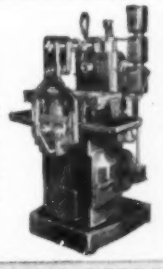

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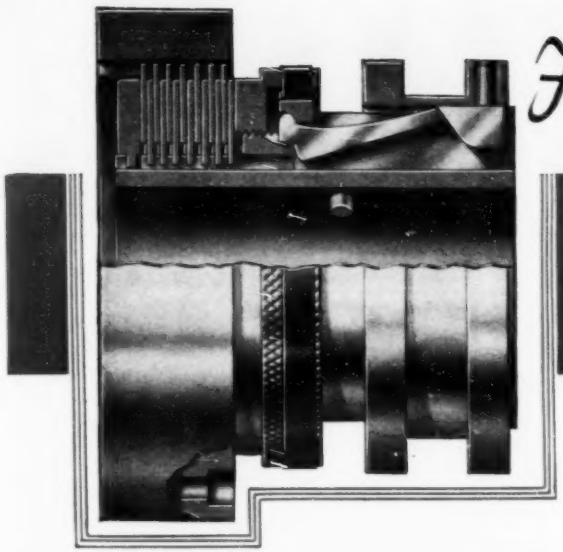

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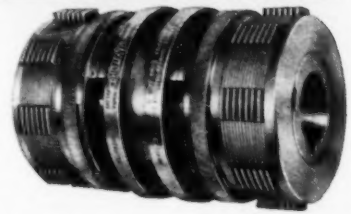

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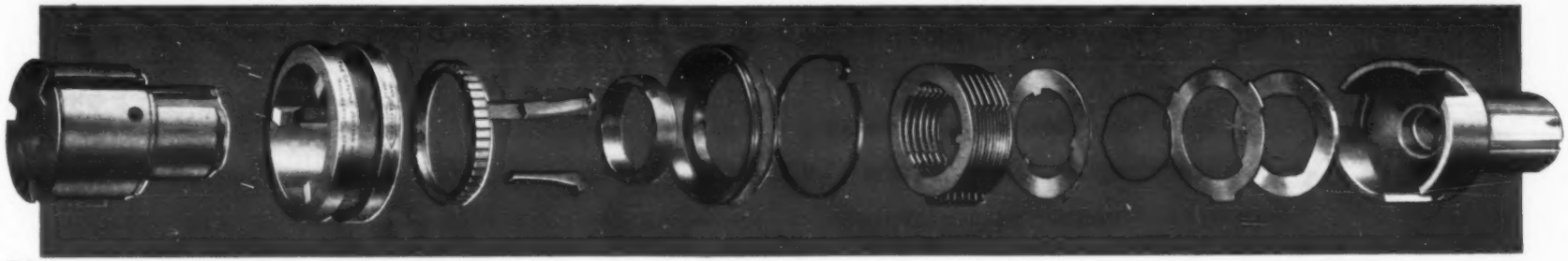

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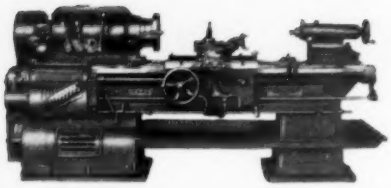

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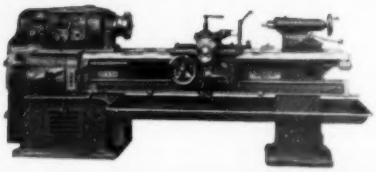

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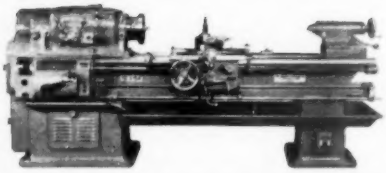

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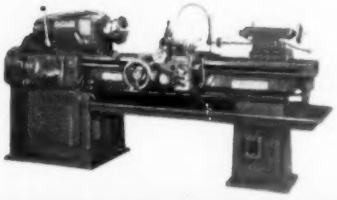

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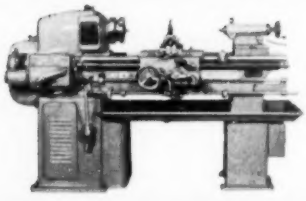

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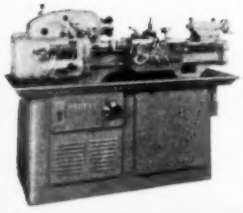

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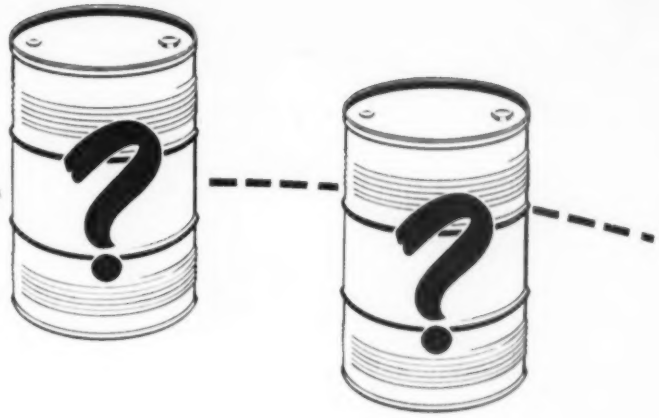

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Electrochemicals Department, Wilmington 98, Delaware
Please send me the literature checked below:

- ☐ "How trichlorethylene is used in metal cleaning".
- ☐ "Triclene" D — an improved vapor degreasing solvent.
- ☐ "Metal degreasing — standard practices."
- ☐ Du Pont publication, "MODERN METAL FINISHING". (Please add my name to the mailing list).

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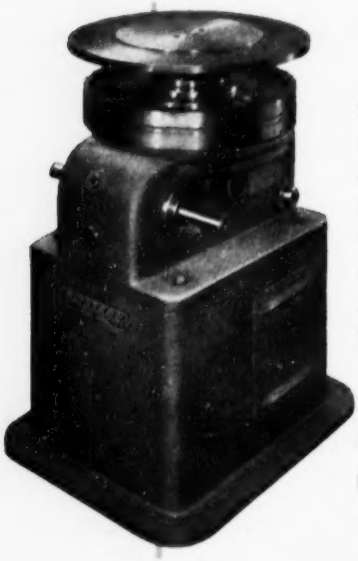
Swanson TURRET INDEXING UNIT



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These ready-made, self-contained turret indexing chassis are available in a wide range of turret diameters, speeds, and stations. By providing a "packaged" intermittent motion unit, they eliminate a large part of the time and cost involved in special automatic machine design and construction. They provide a unit ready to go to work on an infinite variety of special jobs, such as staking, punching, soldering, assembling, piercing, etc. Any operational device may be mounted in any position around the turret on standard, adjustable mounting brackets or to the stationary turret center plate. Large operational devices may be mounted on optional floor base plate. Smooth, trouble-free indexing is by uniform acceleration cross-over cam. A positive locking device guarantees accurate positioning at each work station.

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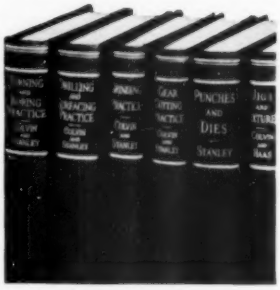

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The Electric Products Co. Deep Well Pump Motors at Big Creek Pumping Station, Mobile, Ala.

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The Electric Products Co., Cleveland, Ohio, is one more manufacturer who has found SKF Spherical Roller Thrust Bearings the solution to the problem of anti-friction support of heavy thrust loads at high speeds, and perfect lubrication.

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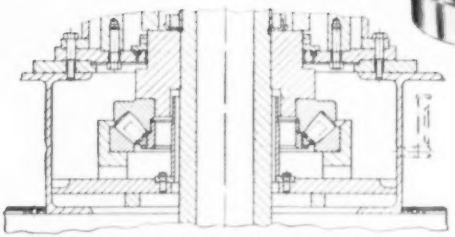

Cross-Section of SKF Spherical Roller Thrust Bearing as designed into the Electric Products Co.'s vertical motors at Big Creek

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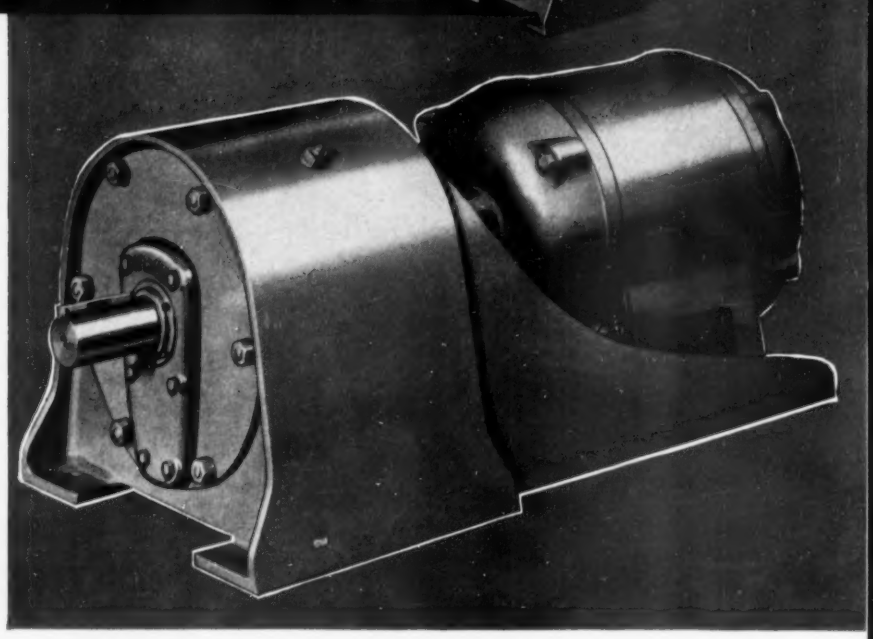
ALL-STEEL FALK Motoreducer

you can interchange motors in minutes... *on the job!*



Fast, easy maintenance gives savings in time and money

With the *all-steel*, All-Motor type FALK Motoreducer . . . the only complete and compact motorized reducer with a separately mounted, resilient Steelflex coupling-connected motor . . . you can replace or interchange motors, *or even parts*, in minutes—*on the job*, without long and costly "down time"! Ratios can be changed (within capacity) without motor modification.

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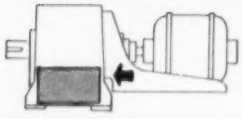
Add to these exclusive maintenance-saving advantages the FALK "In-built" Factors, described at the right, and you have an unbeatable combination of quality, application adaptability, dependability, long-range economy, and dollar-for-dollar value. Write for Bulletin 3104.



Every FALK Motoreducer has these "In-built" Factors—

Positive Lubrication. Large sump capacity . . . oil-tight construction assures clean lubricant . . . direct dip of revolving elements provides positive lubrication at all speeds.

Wide Speed Range. Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

Streamlined inside and outside. Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

Sealed Housings. Dual closures and one-way vents keep oil *in*, dust and moisture *out*. Units are splash-proof, leakproof, dustproof.

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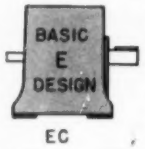
All-steel Housings. Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.



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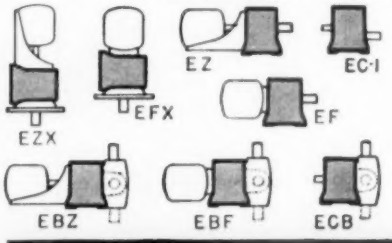

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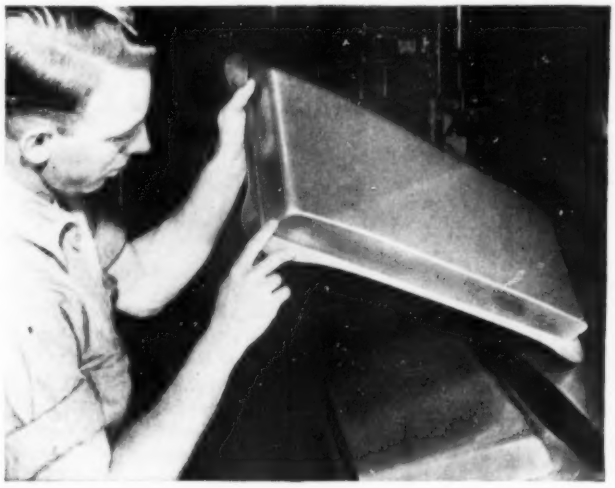
WRITE FOR BULLETIN 3104

JOHNSON'S WAX-DRAW 'HUGS' METALS

New wax lubricant stays with metals at high heats (450°F.) and pressures (200,000 P.S.I.)

The wax molecules in Wax-Draw are charged, like tiny elongated bar magnets. Each of these polar wax molecules clings with great tenacity to metals, stays put, continues to lubricate, thus making possible cleaner, smoother draws on all jobs. Usually successive draws are made without reapplication—saving time and material.



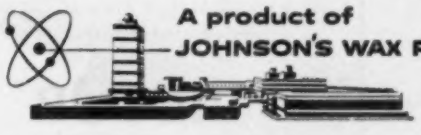
Eliminates breakage in tough draw

Johnson's Wax-Draw is the only lubricant to be used successfully on this forming job at General Metal Products, St. Louis. With other lubricants the job was impossible because of very high breakage. With Wax-Draw there is practically no breakage...and the job has been running for 1½ years. Wax-draw is diluted three to one with water, sponge-applied and drawn wet.

The blank for this top for an oil burning heater is 19⅝" x 37¾", .0359 cold rolled steel. Severe stresses are set up in the metal along the entire back edge. Two draws are required with spot annealing between draws.

Smooth, gall-free surfaces with any type of metal...perfectly formed angles, corners, curves ...multiple draws without reapplication...press pressures frequently reduced and pad pressures increased when desired...reduced work hardening. Applied conventionally, Wax-Draw can be removed easily.

Test Wax-Cool...water-soluble wax coolant
Test Wax-Cut...wax-type cutting oil



A product of JOHNSON'S WAX Research

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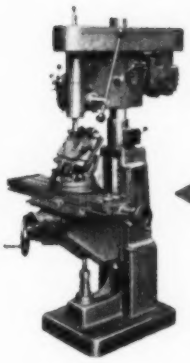

No. FV-2 Saimp Vertical Milling Machine

No. 50 spindle taper, roller bearing spindle, swivel head, power feed and rapid traverse to all movements of table and knee, hand feed to spindle, table working surface 55" x 11¾", 12 geared spindle speeds (30 to 1320 RPM), with motor, control, and coolant pump. $5,975.00

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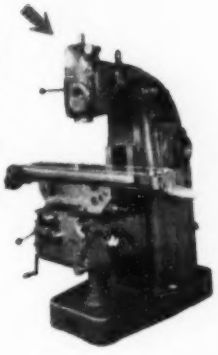

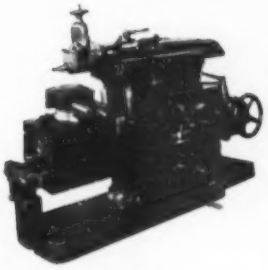

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With power feed and rapid traverse to all table movements, also to rotary movement of table, automatic tool lifter, power feed to tool head, forced feed lubrication, swivel base vise, motor and control. $3,400.00

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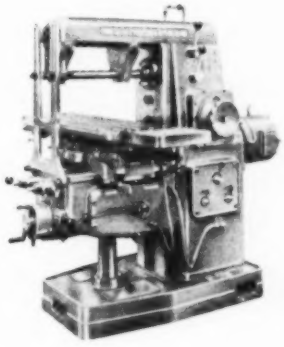

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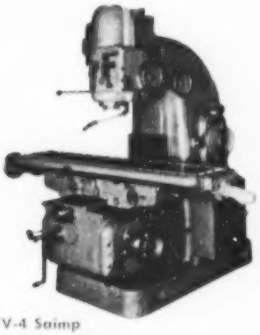

No. FV-4 Saimp Vertical Milling Machine

No. 50 Spindle taper, taper roller bearing, sliding head with 360° swivel, table 80" x 17", power feed and rapid traverse all directions, 18 geared spindle speeds (24-1115 RPM), with motor, control and coolant pump. $17,500.00

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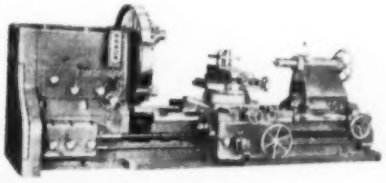

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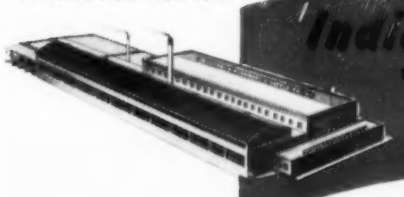

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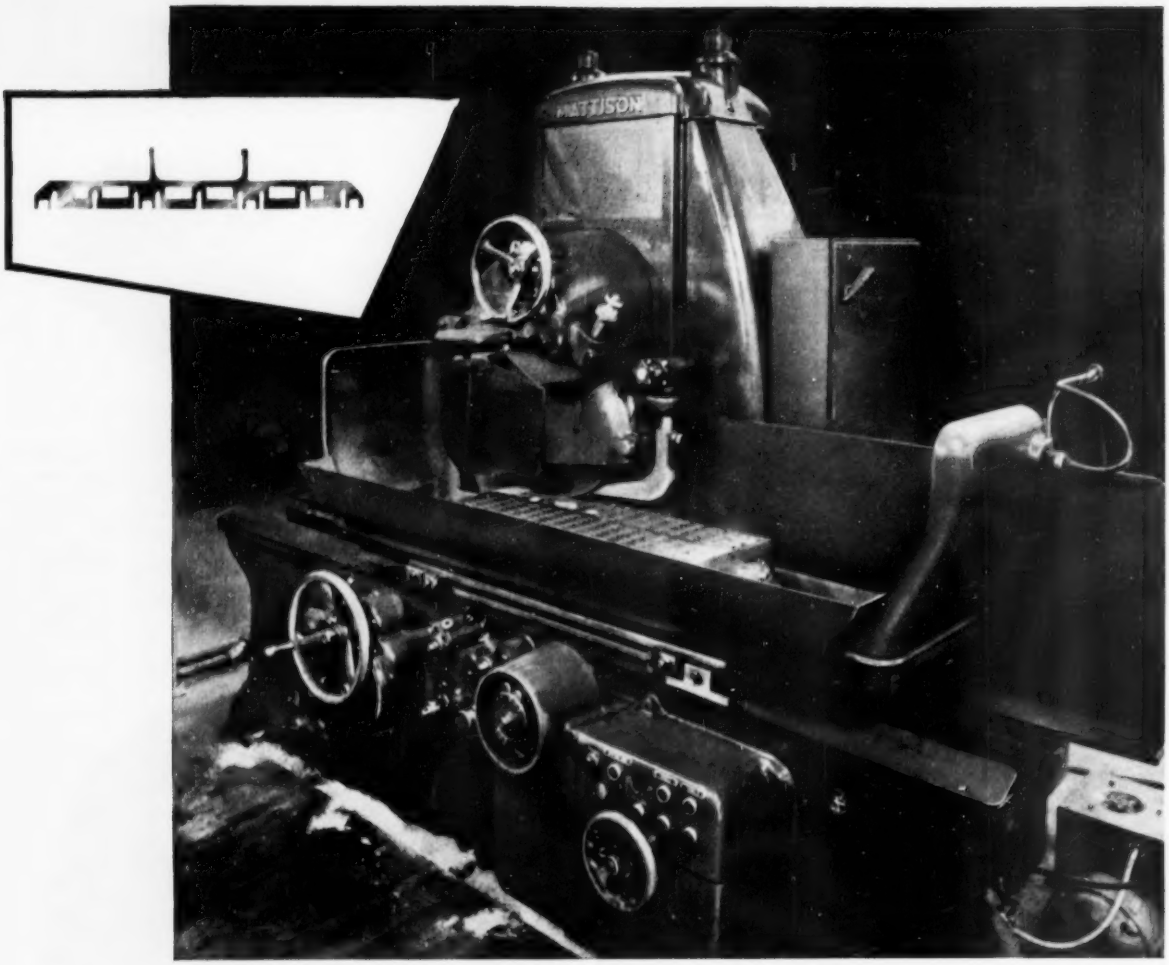

.020 THICK BLADES GROUND 440 AT A TIME ON MATTISON GRINDER FOR SUNBEAM CORPORATION

Here is an unusual grinding job at the Sunbeam Corporation Plant being performed rapidly and accurately with the Mattison Grinder shown above. 440 Shavemaster blades only .020″ thick are ground at one time at a considerable saving in time over previous method.

With the Mattison High-Powered Precision Surface Grinder you have the high power and rugged, double-column construction for rapid stock removal; large capacity which means more pieces of work per load; and the precision and sensitivity necessary for fine, high-quality finish and accuracy to close limits.

This combination not only enables you to step up production on small parts but permits grinding large work which previously could not be handled. Send for free circular containing complete information as well as numerous other examples of work ground on the Mattison Grinder.

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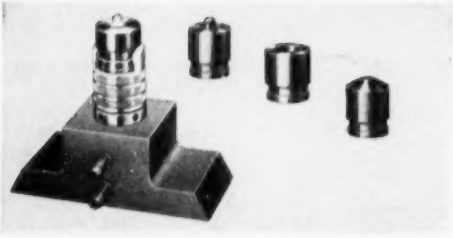
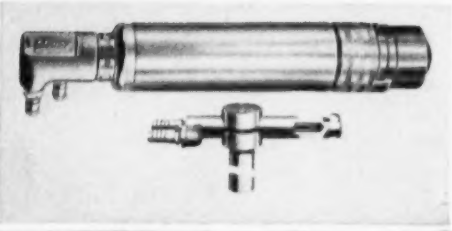


MALLORY "NU-TWIST*" DIE ADAPTORS. Now, you can change resistance welding die set-ups in a matter of seconds. By using different electrodes in the "Nu-Twist" die adaptor you can handle several resistance welding jobs with only one die set-up. A variety of electrode insert blanks is available from stock. Special shapes can be custom made.



MALLORY HOLDERS. Standard holders, available from stock, can be combined to handle practically any resistance welding job requiring extremely light pressures to over 6000 pounds. Mallory "Nu-Twist" and "Premium" holders will perform in the high pressure ranges needed for welds to meet all military specifications.

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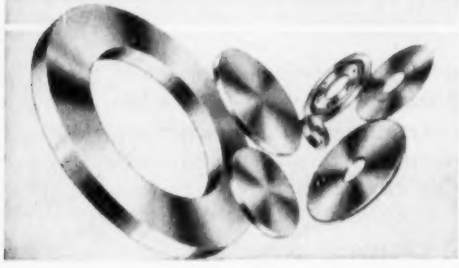

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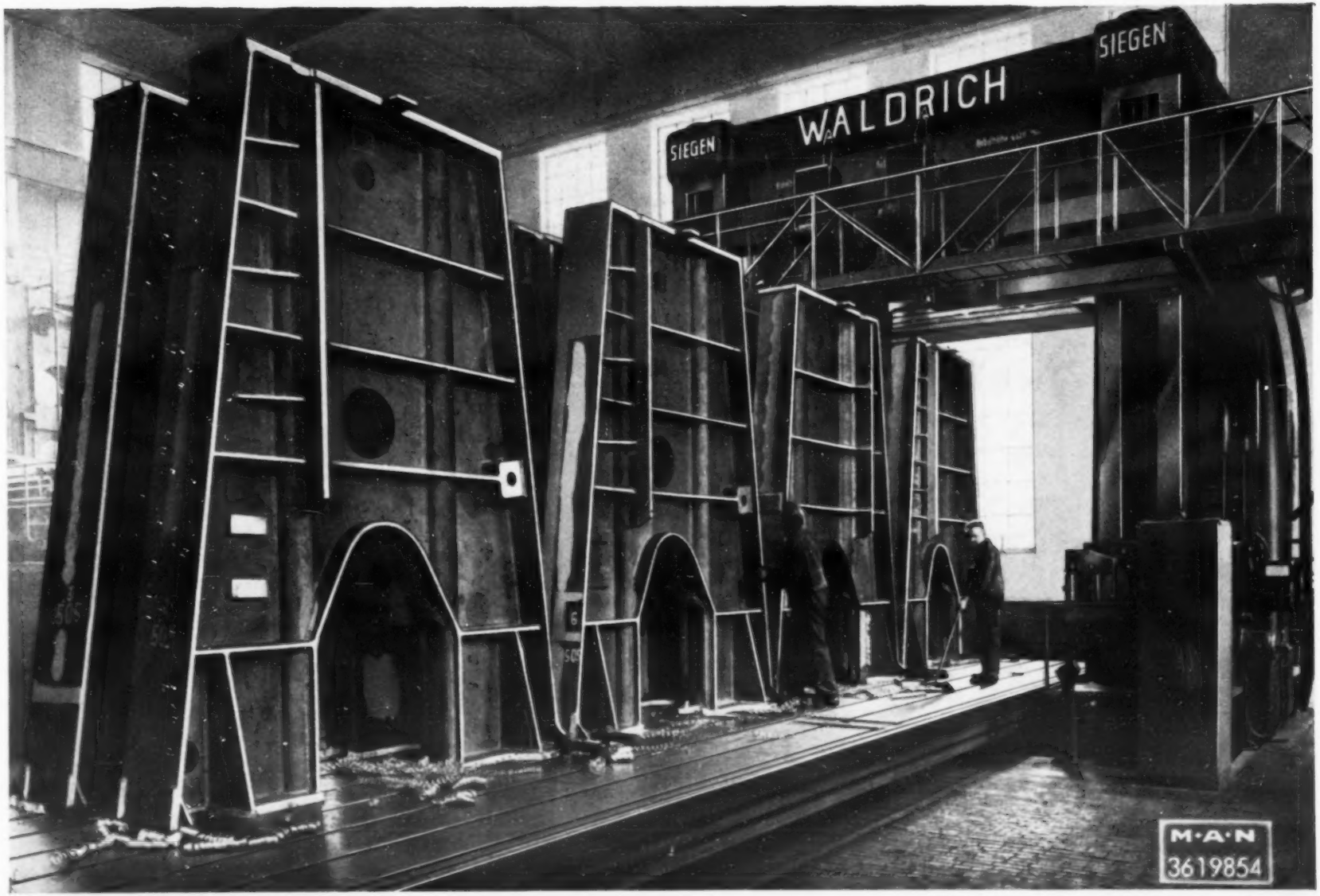
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



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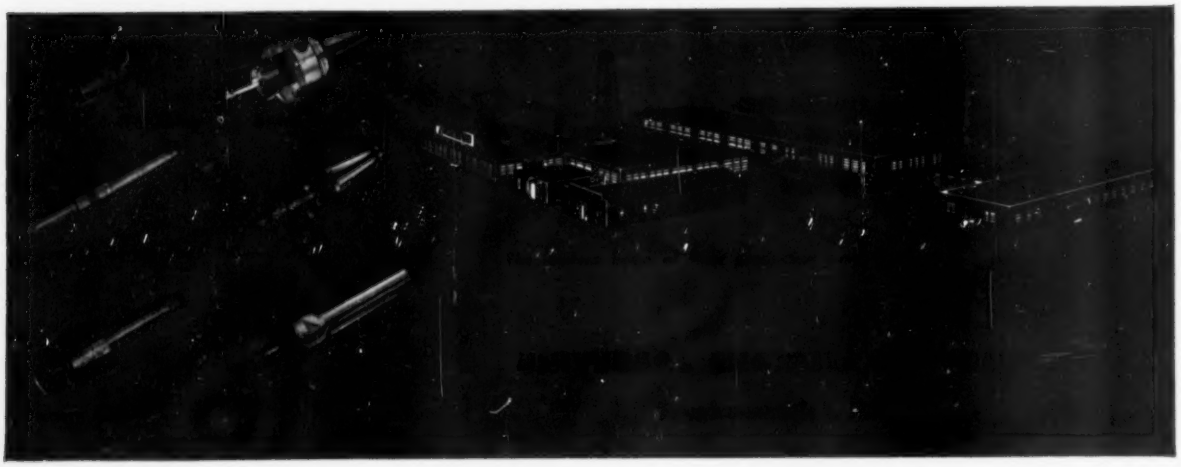

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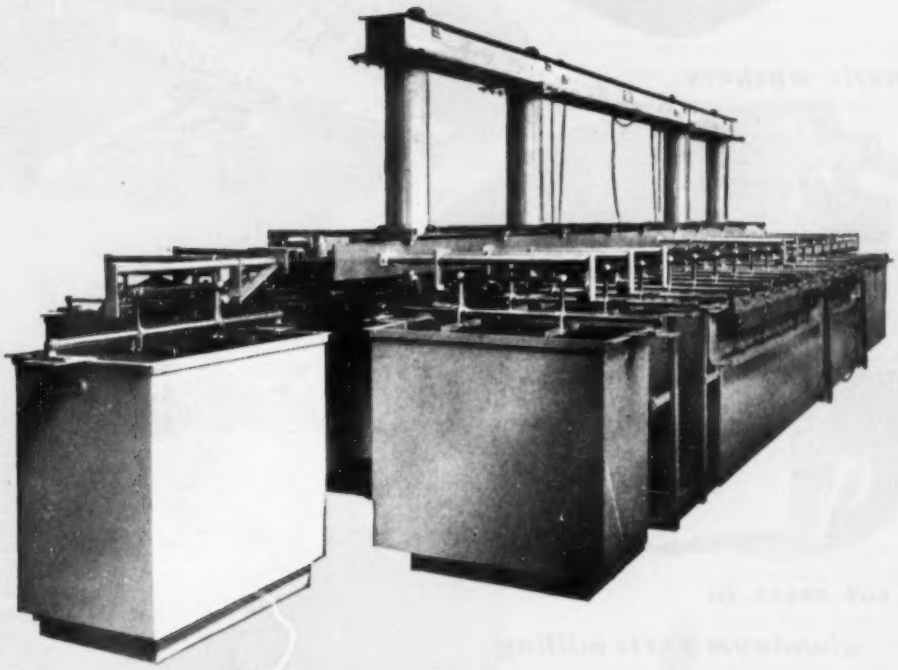

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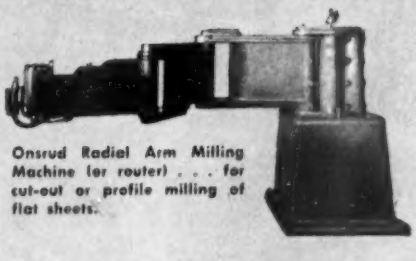

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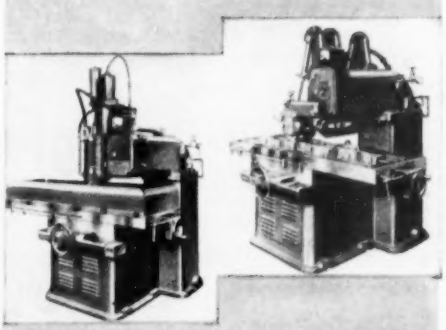
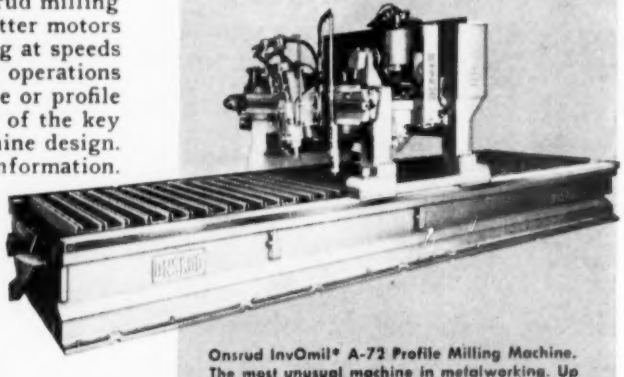


Onsrud A-24 Horizontal and Vertical Milling Machines. For general high speed milling.



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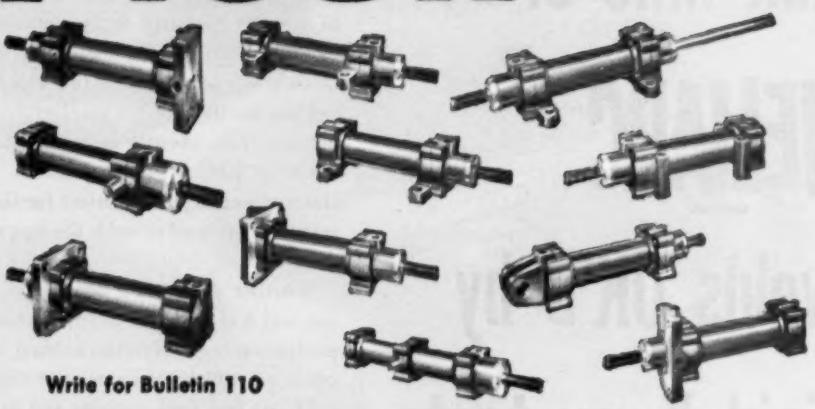

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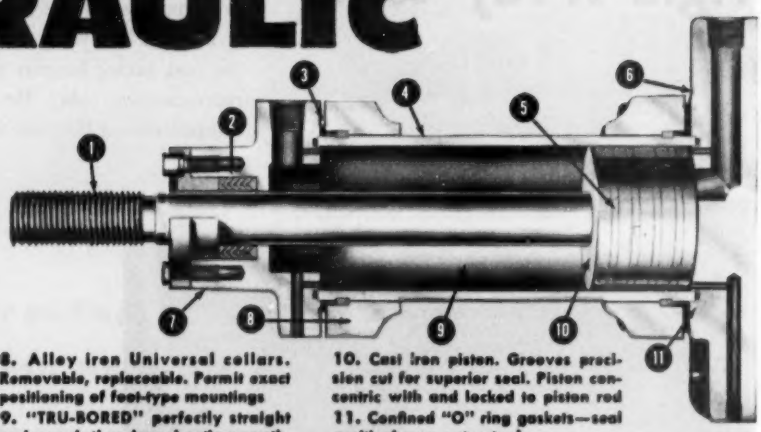

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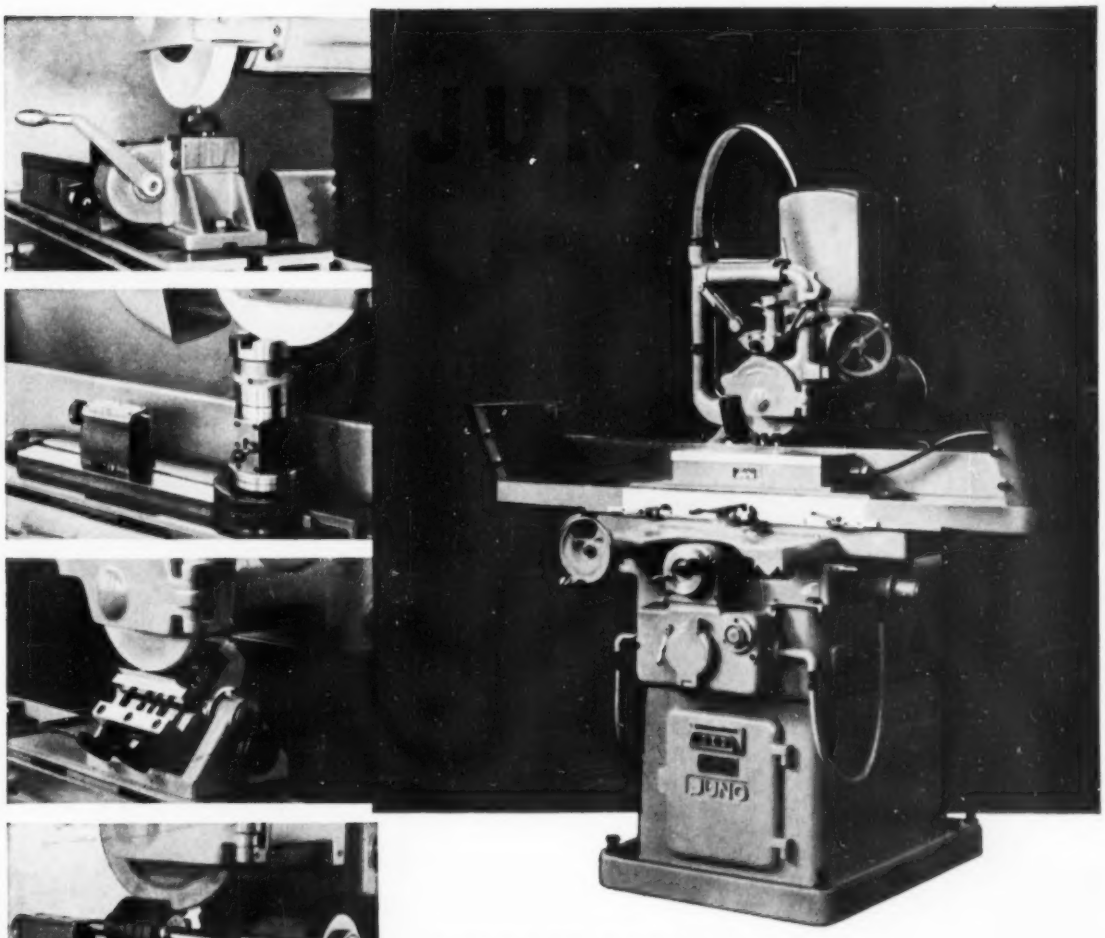

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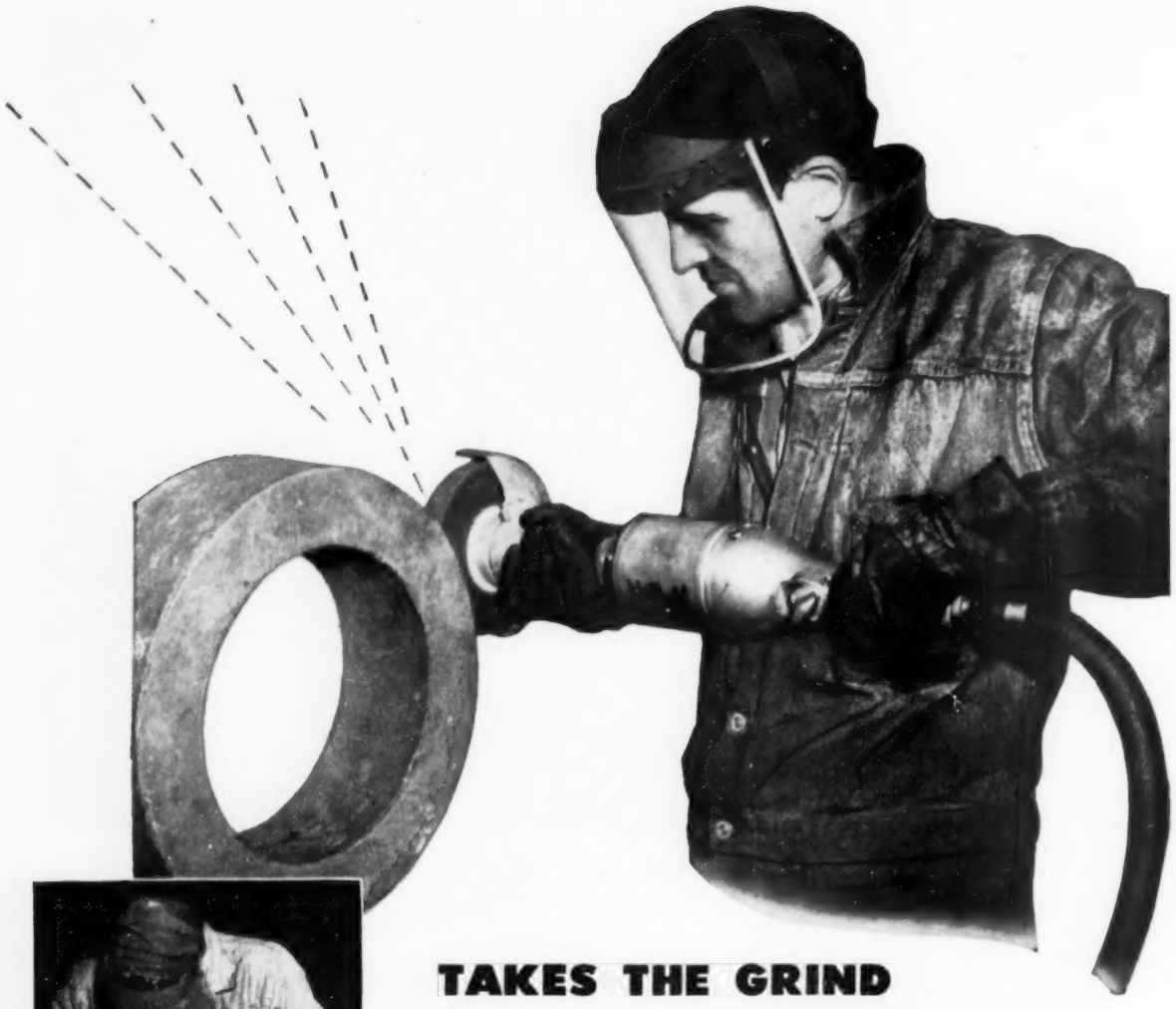

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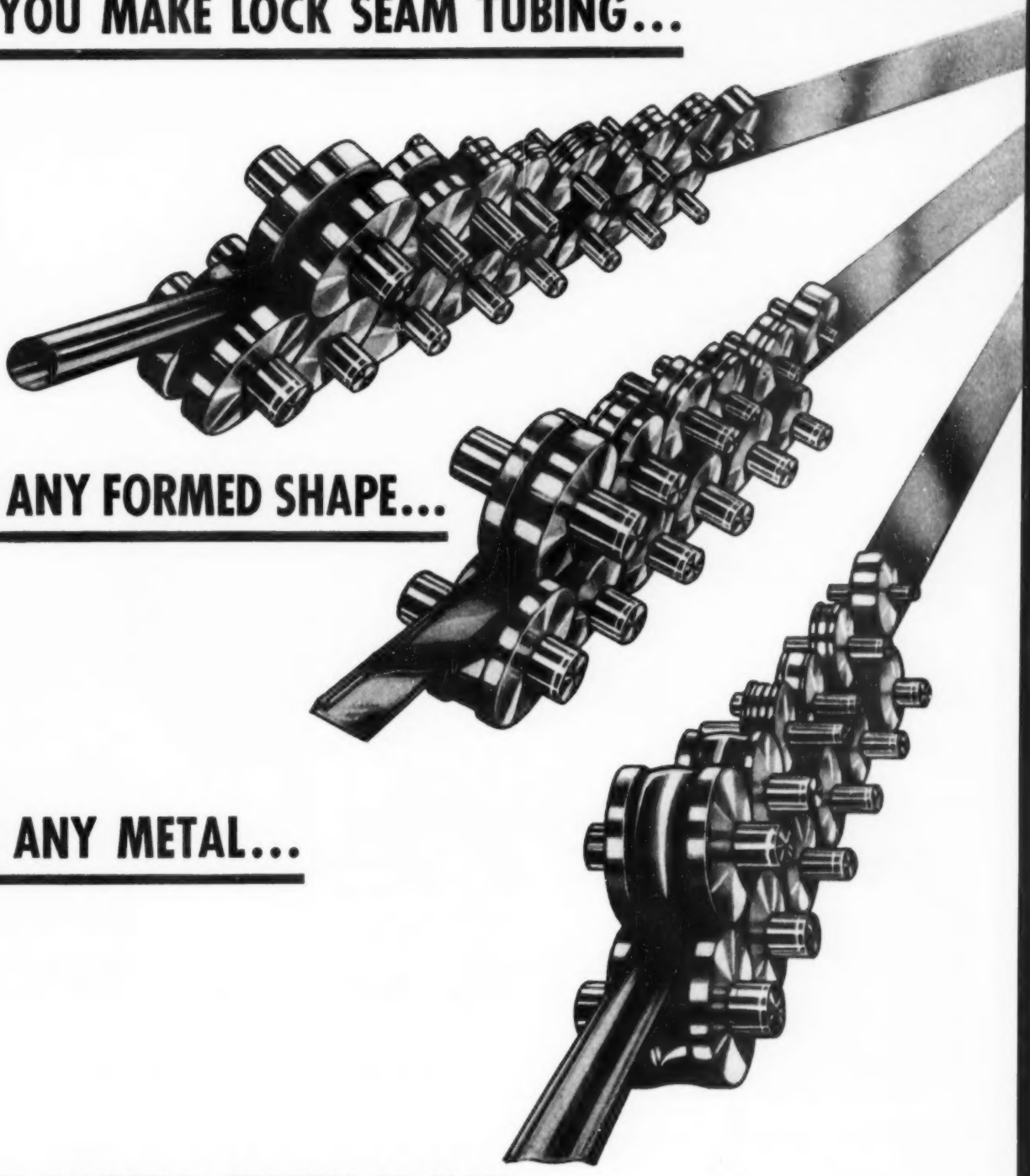

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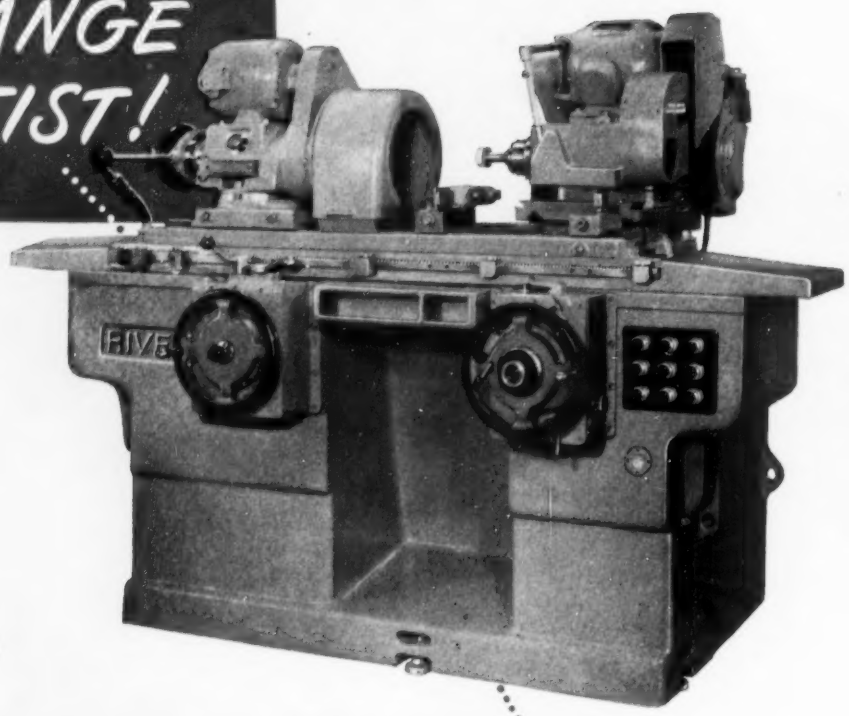

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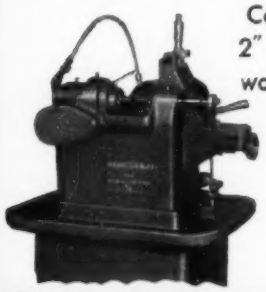

HAMILTON No. 1

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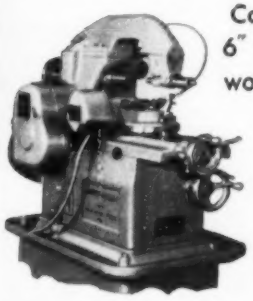

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Exclusive Accumulative error of not more than .0002" guaranteed.

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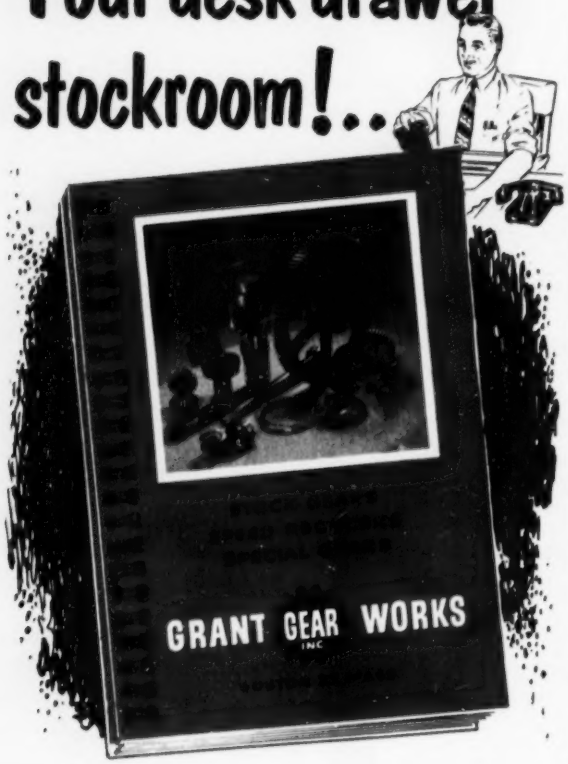

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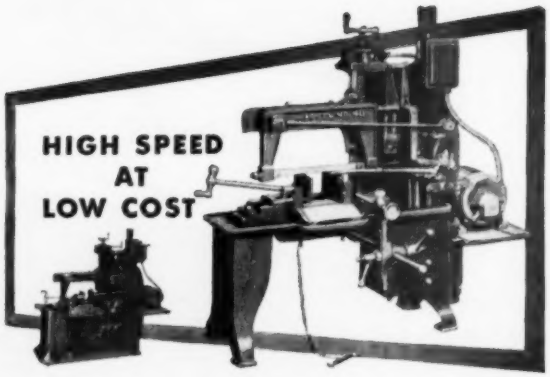

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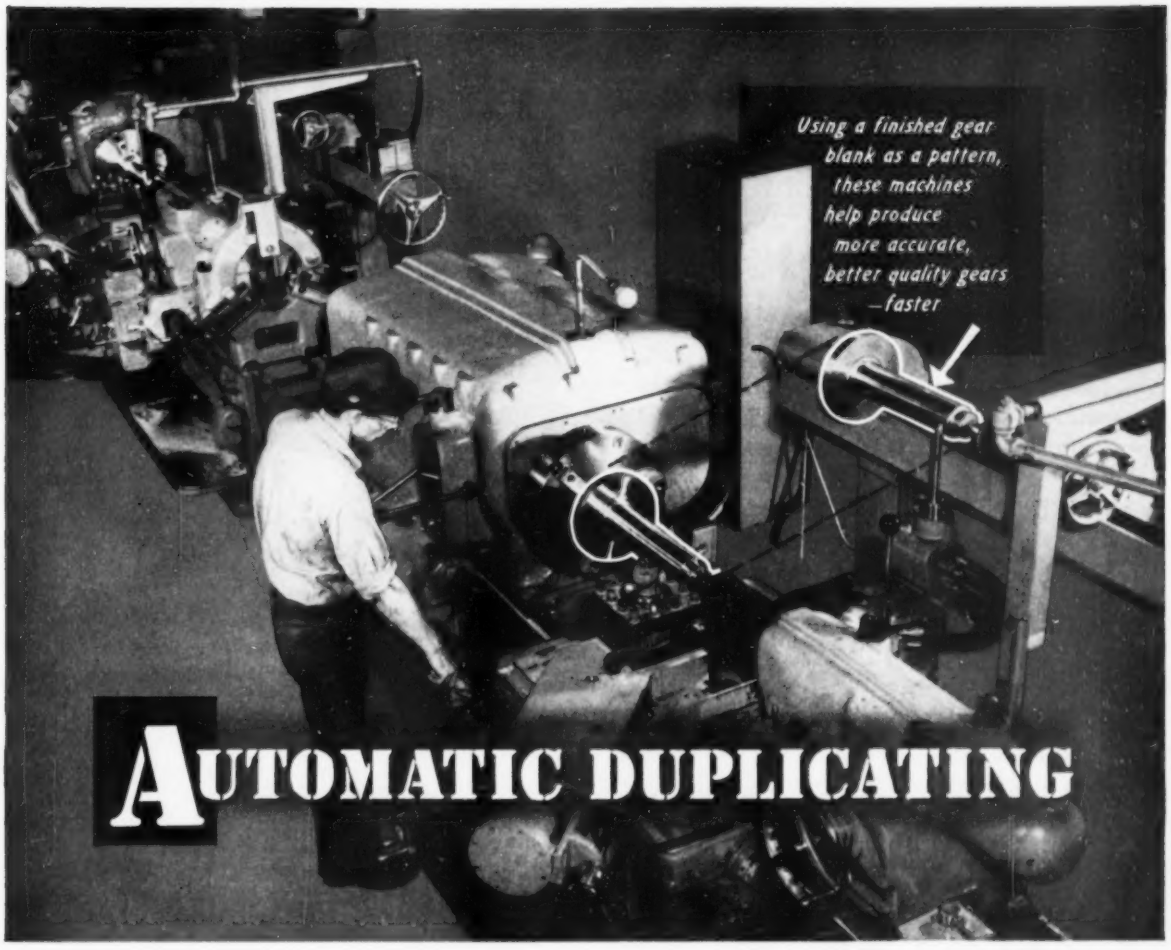

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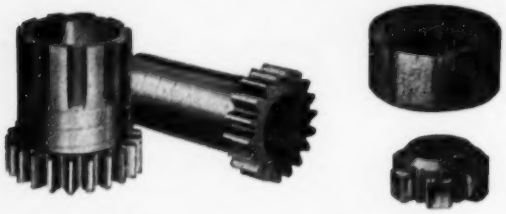

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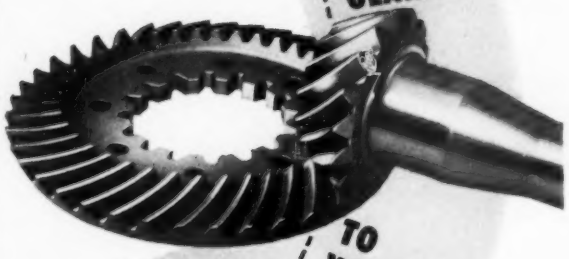

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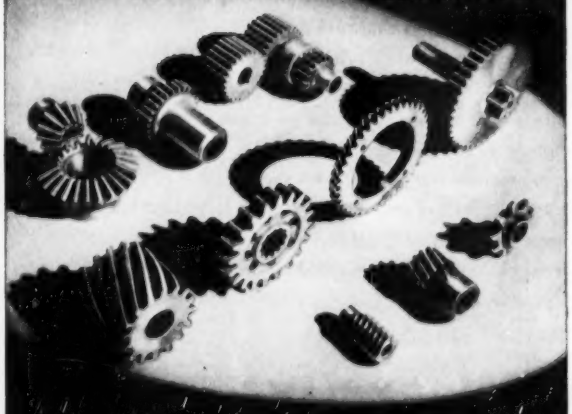

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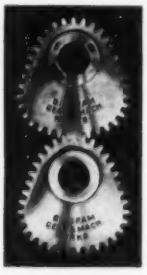

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BILGRAM TRADE MARK

Including: Elliptic and Oval Gears

Also: Every Type of Gear
Any Quantity—Any Material

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When test oil is kept continuously purified by De Laval Centrifugal Oil Purifiers, testing of machinery of all kinds, from aviation or automotive engines to shock absorbers or transmissions, is safer . . . more reliable . . . more economical.

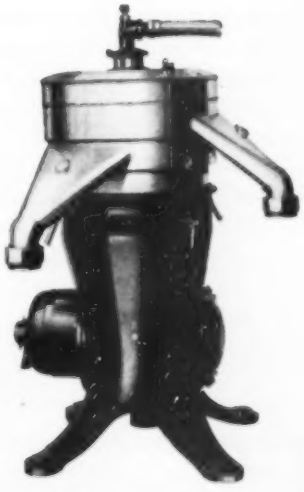
De Laval Oil Purifiers remove by means of centrifugal force the metallic particles, grit, dirt and water from the oil used in the circulating systems of hydraulic mechanisms, eliminating the danger of scoring delicate parts, even though the oil is used over and over again.

De Laval Oil Purifiers may be used in many other ways to reduce production costs in various types of metalworking plants. One application, for instance, is for the removal of foreign material from cutting oil. Such centrifugal purification makes the oil so clean that higher speeds are possible, tool life is lengthened and wear on machine tool parts is minimized.

There are at least 16 other applications for De Laval machines in a metalworking plant of moderate size.

● Write for the check list MM-1.

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco



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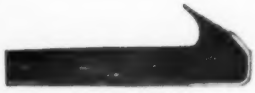
Formed in a conventional rubber pad press

Formed in a Verson-Wheelon Press



Formed in a conventional rubber pad press

Formed in a Verson-Wheelon Press

Formed in a conventional rubber pad press

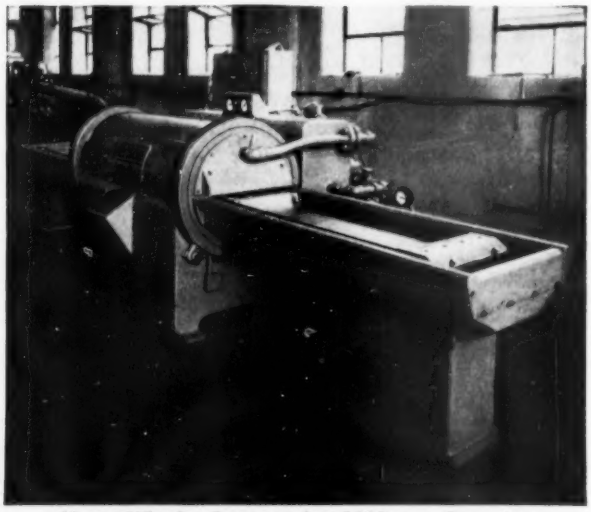
Formed in a Verson-Wheelon Press

Formed in a conventional rubber pad press

The best way to judge the new Verson-Wheelon Direct Acting Hydraulic Press is to compare its work with that of a conventional rubber pad press. The typical examples illustrated above show the difference. Flanges of Verson-Wheelon formed parts are completely formed. Flanges formed in a conventional rubber pad press are often wrinkled and incomplete and require considerable hand finishing.

Add to this the substantially lower price of the Verson-Wheelon unit, its compactness and its elimination of the need for an expensive foundation and you'll see how economy has been combined with superior performance.

Bulletin VW-52 gives design and operating data. Write for a copy.



Verson-Wheelon Press rated at 2500 tons. Operating pressure is 5000 psi. Tray size is 20" x 50". Larger tray sizes and higher pressures are also available.

A Verson Press for every job from 60 tons up.

Verson

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Here's a light, compact tool with a wide range of adjustment. Can drill on squares, rectangles, circles, triangles and irregular patterns.

ADJUSTABLE TAPPING HEAD

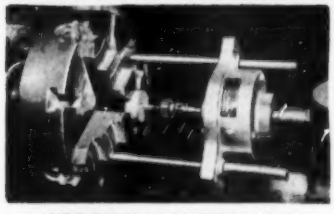
Fully geared. Needle bearings on all spindles in head. Ball thrust bearings throughout. Bronze bushed. Sand cast aluminum case.

ADJUSTABLE DRILLING HEAD

This versatile tool permits you to take advantage of a wide range of adjustment without overhang.

UNIVERSAL JOINT DRILLING HEAD

This dependable tool is adjustable to any pattern of holes. Available with 4 to 12 spindles. All aluminum housing construction, thrust bearings and gears turned on spindles.



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A new tool, practical, time-saving, money-saving. In a turret lathe setup it allows you to tap the hole and back out the tap without stopping the work or reversing the machine.

FOR MULTIPLE DRILLING OF HOLES ON PRODUCTION RUNS . . .

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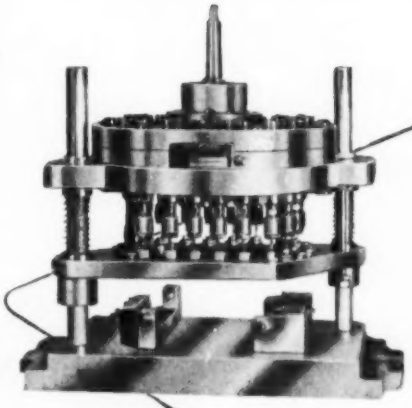

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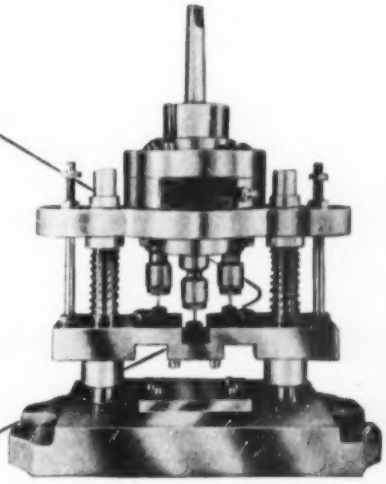

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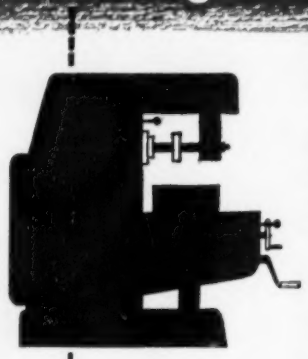

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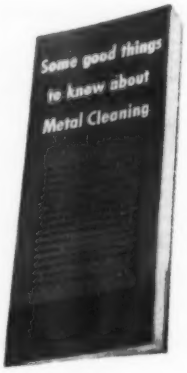

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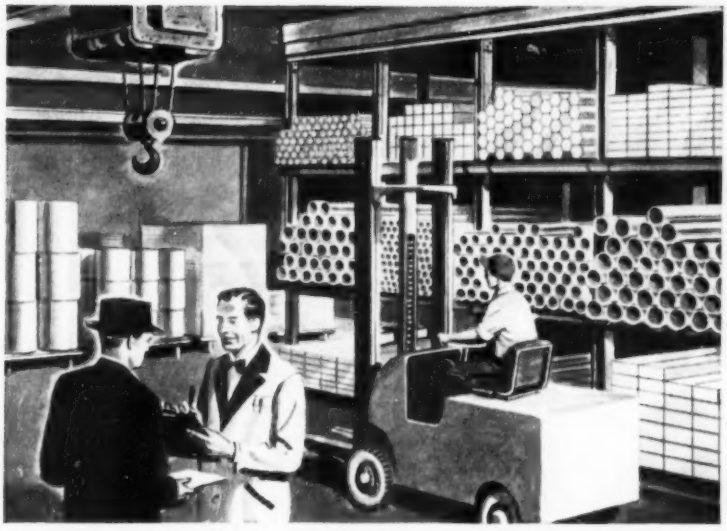

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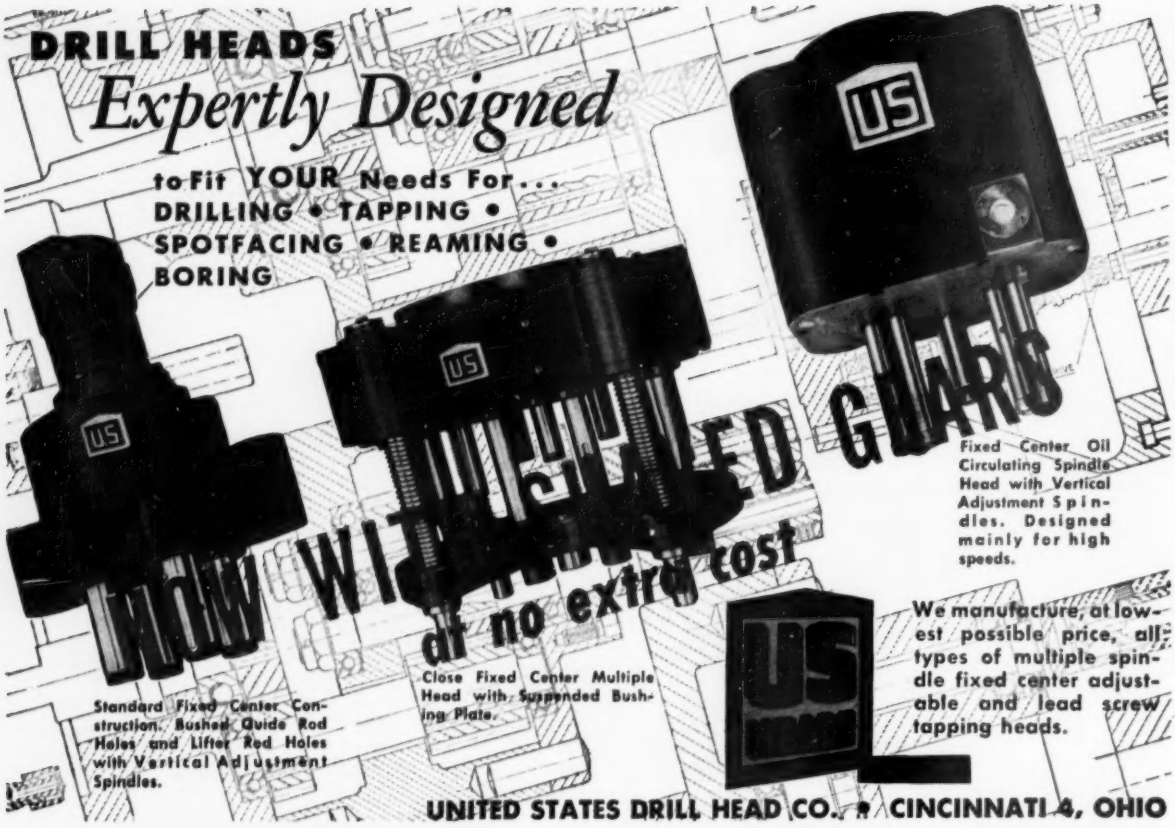

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Overhang

WALTHAM MACHINE WORKS
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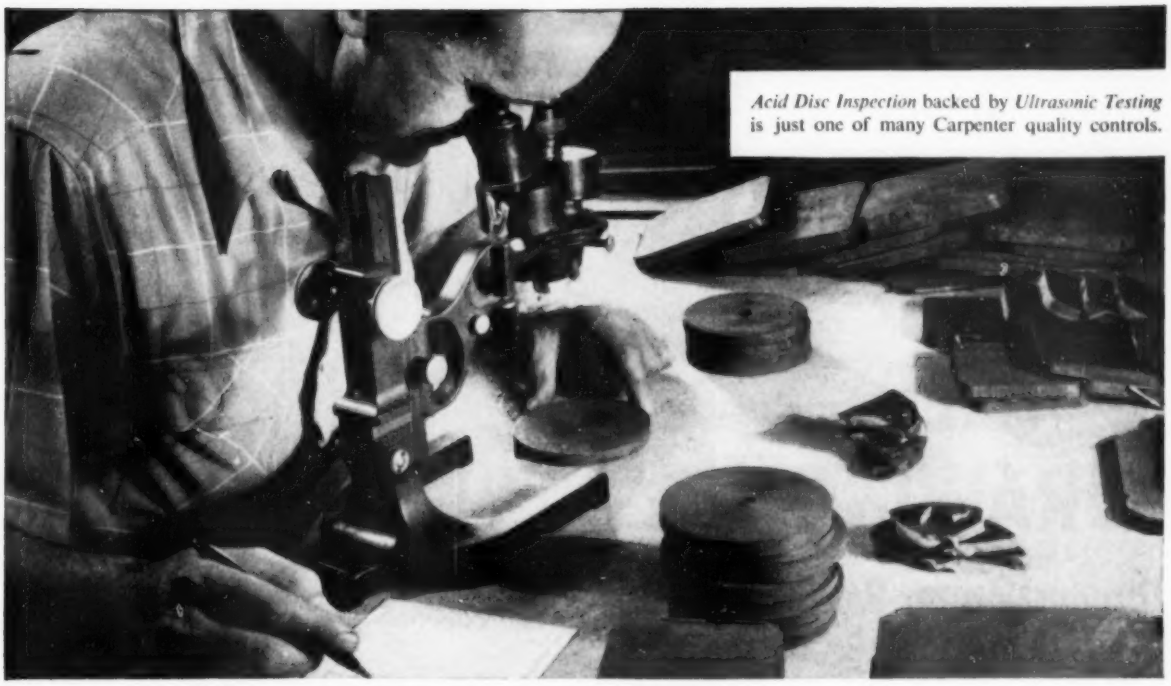


Acid Disc Inspection backed by *Ultrasonic Testing* is just one of many Carpenter quality controls.

IF YOU USE TOOL STEEL, THESE ARE FACTS YOU SHOULD KNOW

When you make or use a tool or die you invest a sizable sum of money. And there are steps you normally take to protect your investment. You make sure the design is right. You follow through with accurate toolmaking and correct heat treating. But there is *one* factor involved in the success of your die, over which you have only indirect control. That factor is the *soundness* of the die steel you start with. After all, if the steel itself isn't right, you needlessly risk your entire investment.

How can you be *sure* the die steel you use has what it takes to assure good tools? The answer lies in the painstaking controls regularly practiced by the steel manufacturer. Listed here are the four important tool steel controls pioneered by Carpenter to give steel users like yourself the protection you need. Before you place that next tool steel order, ask yourself, "Does our steel supplier guarantee these four quality controls in the die steel we use?" Then remember: You can be *sure* of them when you specify Carpenter Matched Tool and Die Steels. And you don't pay anything extra! THE CARPENTER STEEL COMPANY, 109 W. Bern St., Reading, Pa.

4 Tool and Die Steel Developments *Pioneered by Carpenter*
Help Carpenter Customers Cut Costs, Improve Die Performance

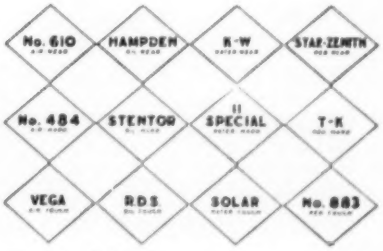
Since 1929:
HOT ACID DISC INSPECTION has been standard practice at Carpenter. To Carpenter customers it provides full assurance that Matched Tool and Die Steels are internally sound, shipment after shipment.

Since 1930:
The TOUGH TIMBRE TEST has assured Carpenter users a wider safe hardening range, greater dependability in performance.

Since 1933:
The TORSION IMPACT TEST has provided Carpenter Matched Tool and Die Steel users with more complete heat treating information that leads to better tools and dies.

Since 1940:
The CONE TEST, used to check and control hardenability of Carpenter water-hardening Matched Tool and Die Steels, has made sure that sections of the same size have uniform hardness penetration in lot after lot.

Carpenter STEEL — Matched Tool and Die Steels



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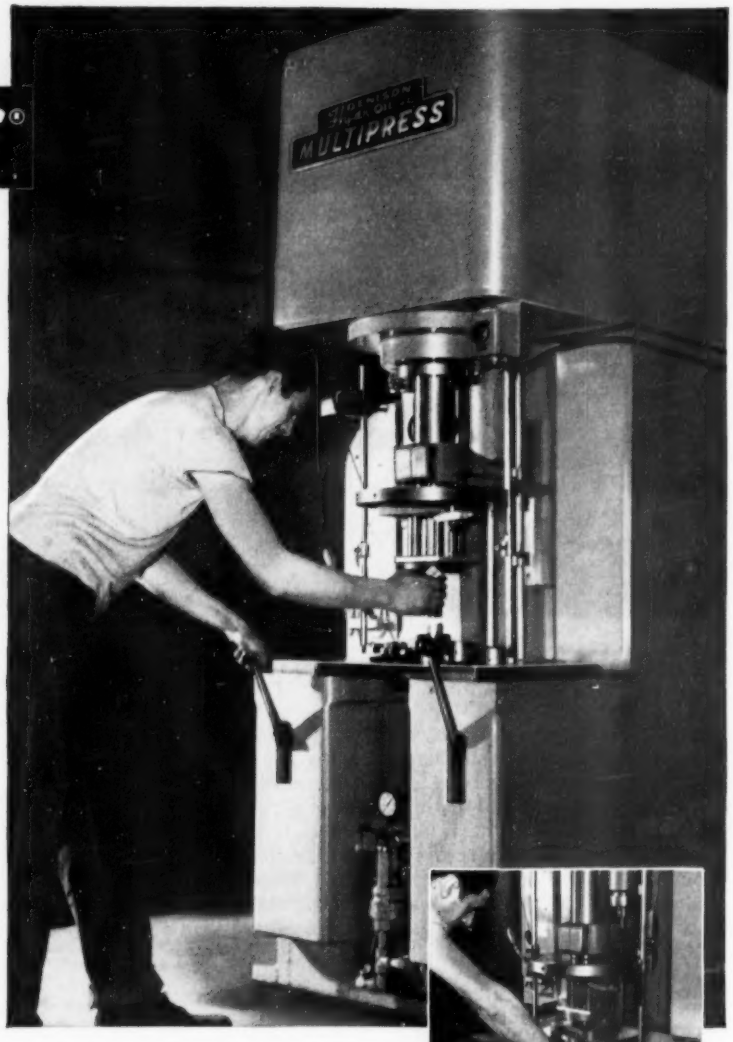
Improves

DEEP DRAWING

Production for Radiad*



"We find that the smooth, evenly controlled speed of the Multipress ram does a better job on a wide range of deep drawing operations," says Mr. Ed Foertsch, President of *Radiad Service, Inc., Chicago.

For most deep drawing operations, Radiad, a widely experienced contract manufacturer uses the 50-ton Denison Multipress. A second hydraulic ram mounted in the U-slot base of the press permits up to 8 tons of upward pressure . . . for added cushioning effect on some operations.

"We also gain by pinch-trimming many flared-lip shapes as part of the final draw," Mr. Foertsch added.

Like many other users, Radiad has proved to themselves that Multipress, with its versatility and speed, is the low-cost answer to drawing needs.

There's no hammer-blow impact as Multipress tooling contacts the work. A steady, positive stream of power draws the metal SMOOTHLY into shape. Stroke length, ram speed, and pressure limits are easily preset to suit each job, or to the flow characteristics of any metal. And the Multipress ram can be set to reverse the instant a pre-set pressure is attained.

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Dual Multipress controls increase safety on drawing jobs at Radiad.

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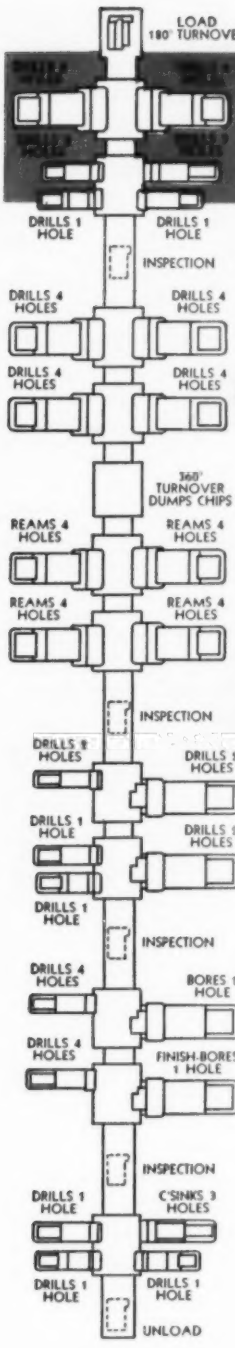
DENISON HydrOILics

Many additional features make Multipress a profitable investment; not only for drawing, but for broaching, bending, forming, stamping, staking, crimping, flaring, riveting, and many other operations. Multipress is built in both bench and floor models; one-ton to 75-ton capacities. Manual or automatic controls for any requirement. Standard Multipress accessories available for many specialized operations. Send for a copy of "MULTIPRESS, and how YOU can use it" or write for information covering your specific needs. There's no obligation.

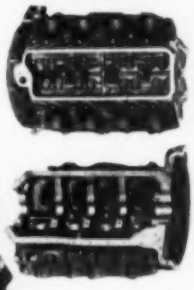
The DENISON Engineering Company, 1164 Dublin Road, Columbus 16, Ohio

GREENLEE

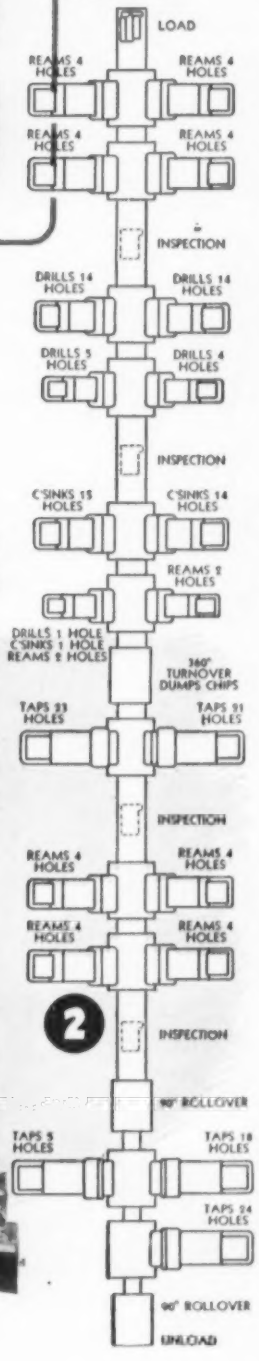
TRANSFER MACHINES



FRONT END
FIRST MACHINE



NEW V-8 BLOCKS



PERFORM 289 OPERATIONS ON V-8 CYLINDER BLOCKS AT 75 BLOCKS PER HOUR

New tooling for a brand new V-8 motor includes three lines of Greenlee Automatic Transfer Machines similar to the units illustrated. Each 2-machine line performs 289 operations on cylinder blocks during a 45-second cycle.

Sound construction, proved engineering, and a background of experience in building special machinery that dates back to 1918 assure you profitable, trouble-free operation.

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The Forger
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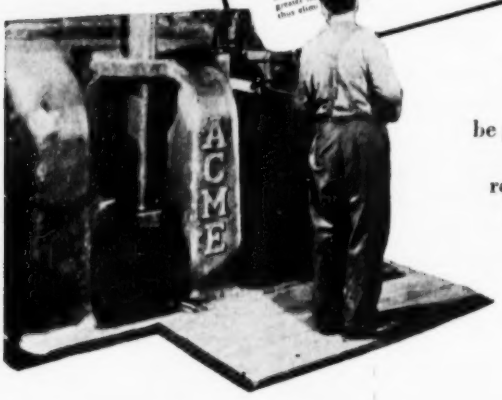

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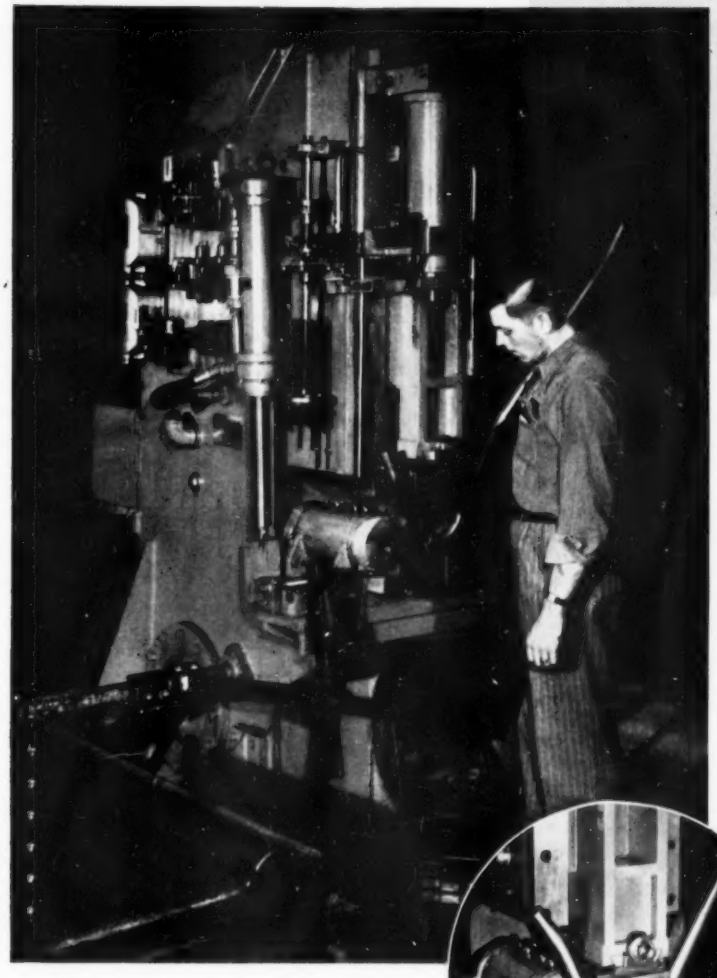
PRODUCES AUTOMOTIVE EXHAUST PIPES

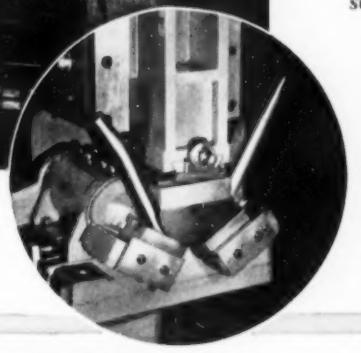
50% FASTER

The new Pines 20-Ton Hydraulic Pipe and Tube Bending Press is now establishing new records of production efficiency on many different bending operations. For example, on automotive exhaust and tail-pipes, multiple bends with 4" and 6" radii are now produced in 1-1/4" to 2" O.D. 16 ga.-18 ga. tubing at speeds ranging from 600 to over 800 bends per hour.

On an over-all basis, current results show these jobs are produced 50% faster than with ordinary bending press equipment. At the same time, because of the design of the Pines, savings up to 30% in setup time are effected. Further, because more jobs can be handled in a single setup, there's a substantial reduction in tooling expense. If you have work adaptable to a bending press, it will pay you to see Pines today.



▲ Production view of new Hydraulic Bending Press. Note angle-of-bend selector, side-mounted die cushion, panel-mounted valves, and oil cooler.



◀ Closeup view of Pines Bending Press forming 4th bend in a 1⅝" (16 ga.) CRS automotive exhaust pipe. Note how wing dies are controlled by side-mounted cushions through heavy crank arms. Interchangeable pick-off turret of angle-of-bend selector saves set-up time on repeat jobs.

CHECK THESE COST-CUTTING PRODUCTION FEATURES

- ✔ **Twin Equalizing Side-Mounted Cushions** — provide greater working clearance, maintain constant torque, reduce flattening and distortion.
- ✔ **Faster Cycling** — angle-of-bend selector indexes and resets to starting position automatically without indexing through idle stations, increases output.
- ✔ **Greater Work Handling Capacity** — extra clearance reduces number of setups on multiple bending, permits broader use of uniform radii, cuts tooling and production costs.
- ✔ **Interchangeable Pick-Off Turret** — for angle-of-bend control. Permits storing and remounting for repetitive jobs, reduces setup time.
- ✔ **Adjustable Ram Speed Control** — assures efficient operation, simplifies setups. Ram can be lowered slowly or stopped at any point.

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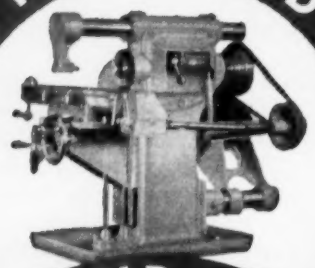
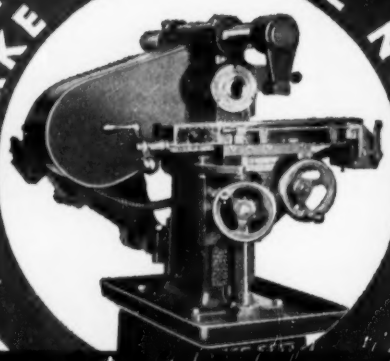


BURKE HAND FEED NO. 3

BURKE UNIVERSAL NO. 4



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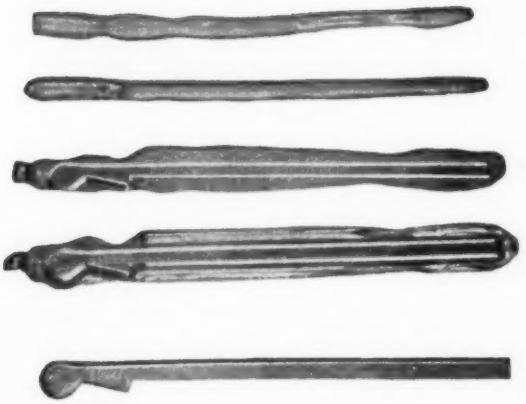
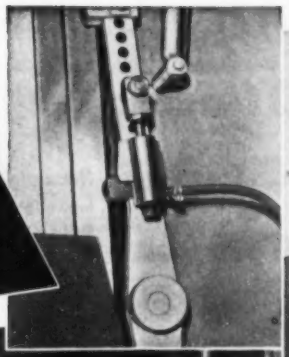
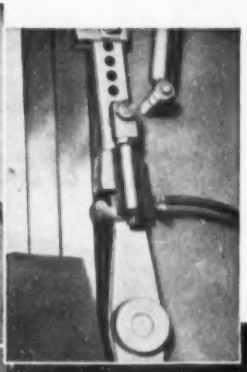


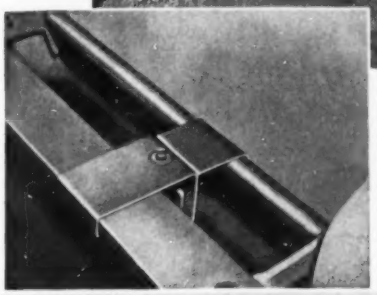




An installation of a Short Stroke Control on a 2500 lb. CHAMBERSBURG CECO-DROP HAMMER is shown, forging steel ankle joints for leg braces. Above are samples of the forging as it appears during various stages. The forging process begins with a series of 20 to 23 short, rapid blows (about 18" stroke) to draw the 7/8" dia. stock. This is followed by two long blows (about 35" stroke) to roll it, three more long blows in the rough impression, and three more long blows to complete the forging. After the last blow the ram is stopped on the up-stroke at the "short blow" position for the next forging.

Short Stroke Control is but one of the many features of Chambersburg CECO-DROPS. These piston lift, gravity drop hammers are setting new standards in forge shop production. Lower operating costs, minimum down time, easy operation, wide range of operations, extra safety; all add up to "more forging per hour" the basis on which to judge the efficiency of a Drop Hammer. Write for Bulletin 11-L-0.

CHAMBERSBURG ENGINEERING COMPANY
CHAMBERSBURG, PA.



(Above right) Dog in full stroke Position. Wedge is lifted, Short Stroke Control is inoperative.

(Above left) Dog in Short Stroke Position. Wedge is down, holding dog in operating position.

(Lower left) Button on treadle when depressed by operator shortens the stroke. Release reverts to full stroke.

CHAMBERSBURG

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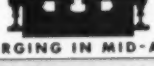
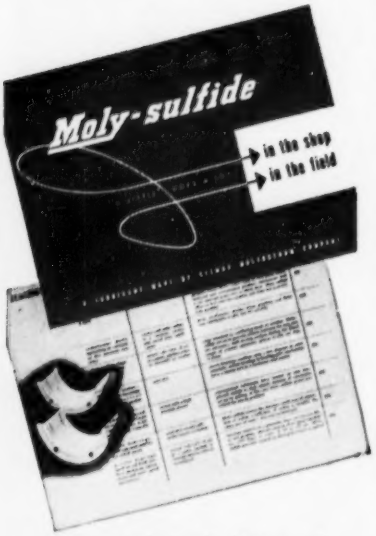
Builders of **THE IMPACTER**



"FORGING IN MID-AIR"

154 ideas on ways to use...



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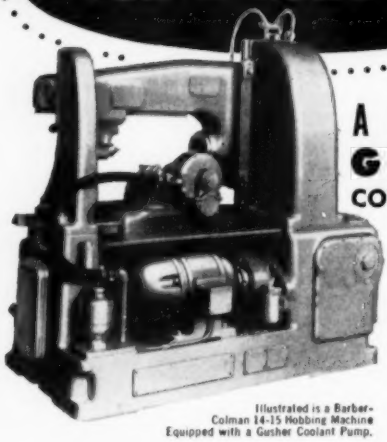

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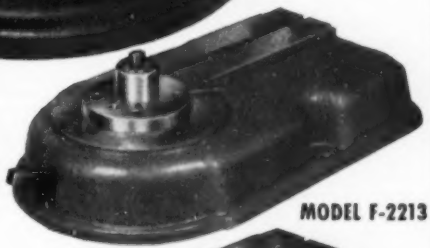
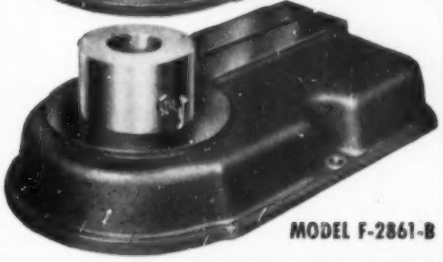


MODEL F-2213



MODEL F-2861-B

See our Catalog 52 for cost-reducing Beaver Tools

Beaver TOOL AND ENGINEERING CORPORATION

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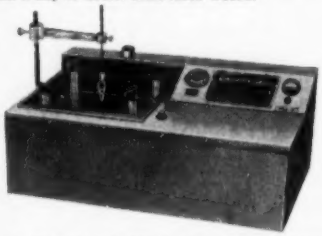

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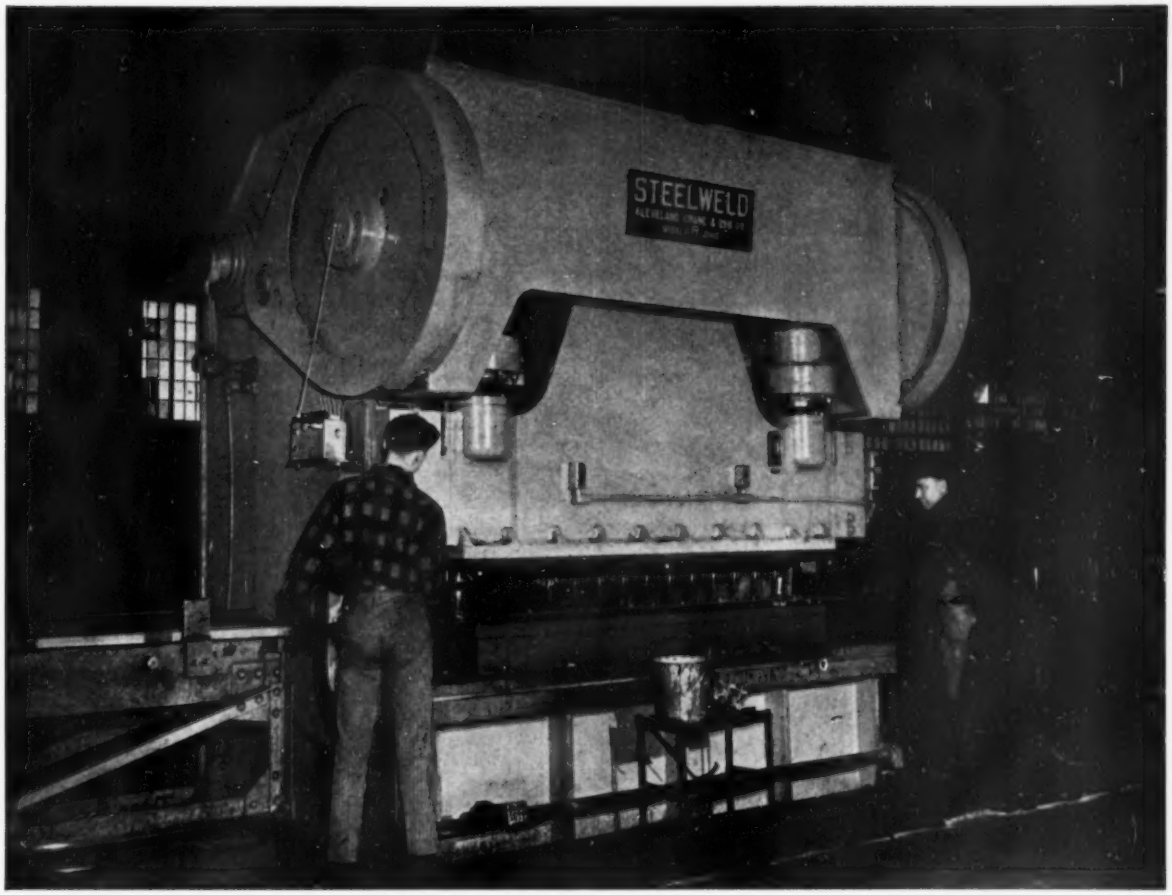

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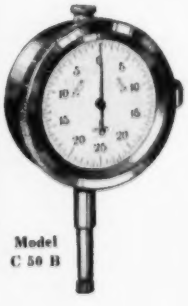
RANDALL and STICKNEY
Dial Gauges and Indicators



Model C 50 B

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2½" overall diameter, balanced dial 0-25-0 with .0005" graduations, ½" range and movable dial easily set at zero.

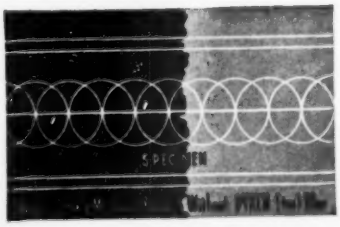
The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1896

DYKEM STEEL BLUE

STOPS LOSSES
making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301B North 11th St., St. Louis 6, Mo.

Modernizing? Expanding? It will pay you to choose CLEVELANDS!

CLEVELAND Four Point Press having a stroke of 40", bed area 102" x 204" and 600 tons capacity.

Whether you're contemplating replacement of a press that no longer meets today's production standards, or considering adding more presses to those you already have, we urge you to study the comparative value of all modern presses. We're sure you'll decide in favor of Cleveland Presses equipped with the revolutionary Cleveland (patented) Drum Type Air Friction Clutch.

All 12 different types of Cleveland Presses are available in a wide range of sizes and capacities. It's easy to find the exact Cleveland that gives you utmost efficiency for your particular needs.

So if you're out to step-up production and lower operating costs, then by all means, check Clevelands before you buy your next press! Let a Cleveland engineer show you why a Cleveland Press with a Cleveland (patented) Clutch is your outstanding press value. Write or call today!

THE CLEVELAND PUNCH & SHEAR WORKS CO. U.S.A.

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY

CLEVELAND 14 • OHIO

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • E. LANSING

HERE'S THE BEST WAY TO CLEAN AND STERILIZE **DIRTY COOLANTS**

Bowser wheel tanks quickly and efficiently remove dirty coolant from machine sumps . . . replace it with cutting oils filtered and sterilized in Bowser filters.

Two-way high-capacity pump saves time and labor . . . easy to operate.

Our nearest sales engineer will welcome an opportunity to discuss your coolant problems.

May he call at your convenience?

BOWSER

BOWSER, INC., 1316 Creighton Ave., Fort Wayne 2, Indiana

REGIONAL OFFICES: ATLANTA • CLEVELAND • DALLAS • FORT WAYNE
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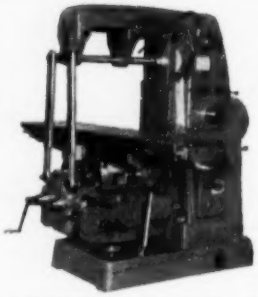
CERVINIA 4

Universal Milling Machine

DELIVERIES prompt

COST very low



SPARE PARTS available

SERVICE nationwide

SPECIFICATIONS: MORSE TAPER NST No. 50 • WORKING SURFACE 67" x 15⅝" • POWER FEED RANGES: Longitudinal 47¼", Cross 13⅜", Vertical 19" • 24 FEEDS: Range 3/64" to 18" per minute • RAPID TRAVERSE: 60" per minute • 12 SPINDLE SPEEDS: Range 16 to 1000 rpm MOTOR 8 HP • **For further information, write or call: MISAL MACHINERY, INC.**

ENGINE LATHES | RADIAL DRILLS | TURRET LATHES | **MISAL** | SHAPING MACHINES | MILLING MACHINES | GRINDING MACHINES

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The 1954 PRODUCTION PLANBOOK *for Metalworking*

The 1954 PRODUCTION PLANBOOK will be the first of a continuing new service, made available to you each year *at no additional cost*, as a 27th issue in your regular subscription to *American Machinist*. You will find the PRODUCTION PLANBOOK to be the most lastingly useful working reference you have. Expect your copy in mid-November.

Featured in the PRODUCTION PLANBOOK, and bringing you significant facts and figures *available nowhere else*, will be the new *American Machinist* inventory of Metalworking Production Equipment. Another important division will be a thorough analysis of various methods which have been devised (including the MAPI Formula) to enable you to decide when it is wise and profitable to replace an old piece of equipment or machinery with a new, more efficient one.

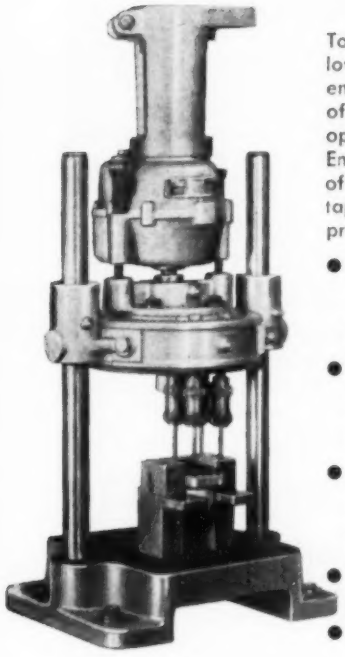
Other sections of the PRODUCTION PLANBOOK will present an authoritative picture of the market outlook for next year . . . and you'll get plenty of valuable information and useful ideas from a big section of case histories of successful modernization programs in many different plants.

American Machinist
McGraw-Hill Building
New York 36, N.Y.

If you tap or drill small parts

you can't afford to be without— Ettco-Emrick

"UNIT-ENGINEERED" MULTIPLE HEADS



To put your small parts tapping and drilling on a low-cost, mass production basis you need specially engineered methods and equipment. Ettco's years of specialization in this field has led to the development and refinement of the Ettco-Emrick "Unit-Engineered" Multiple Head System, which is one of today's fastest, most economical methods of tapping and drilling small parts. Here's what it provides —

- *Multiple head and work holder engineered as a unit for your specific part to insure fastest handling and production with each stroke of the drill press.*
- *A selection of dozens of different standardized methods of handling a wide variety of shapes and sizes of parts and number and spacing of holes.*
- *Interchangeable tapping and drilling face plates to permit quick, easy changeovers from tapping to drilling — a patented Ettco-Emrick feature.*
- *A design that assures quick, easy installation on any make or model drill press.*
- *A limitless variety of spindle arrangements with capacities ranging from wire sizes to ⅝" in steel.*

DO JOBS LIKE THESE FASTER, EASIER, AT LESS COST

Steel outlet box with 4 tapped holes. Production—12,800 tapped holes per hour with dual multiple head unit.

54 holes drilled and countersunk in one operation with a multiple head and electric indexing fixture.

Die casting with 6 holes — 3 in each of two planes — automatically positioned and tapped in one operation.

If your small parts production calls for multiple drilling, reaming, countersinking, tapping or threading — it will pay you to check with Ettco. Call in your nearest Ettco-Emrick distributor or send us a sample or drawing for recommendations and estimates.

FOR DETAILS, WRITE FOR BULLETIN No. 3

Ettco-Emrick

ETTCO TOOL CO., INC.

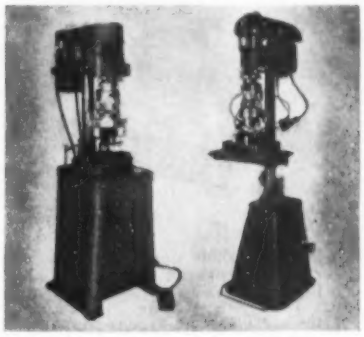
590 Johnson Ave., Brooklyn 37, N. Y.

DETROIT • CHICAGO • WORCESTER • SAN GABRIEL, CALIF.

Dealers throughout the United States and Canada

DRILLING and TAPPING EQUIPMENT NEWS

Tapping Machines Boost Multiple Head Output

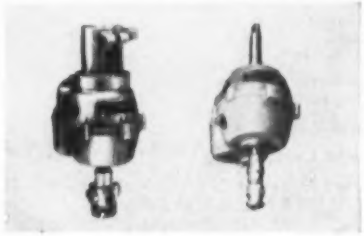


Ettco-Emrick tapping machines are designed for automatic or semi-automatic operation with multiple spindle drilling or tapping heads and single spindle tapping attachments. The No. 72A machine is foot or air-operated. The No. 74 machine is air operated and electrically controlled. *Details in Bulletins No. 72A and No. 74. Write Ettco Tool Co., 590 Johnson Avenue, Brooklyn 37, N. Y.*

Electric Indexing Fixture Has Fast, Precise Action

Ettco-Emrick Indexing Fixtures provide smooth, shockless, positive action. Can be used on any machine base. Synchronization of index fixture with outside machine member is electrically controlled. Utilizes interchangeable nesting plates ranging from 10" to 14" in diameter. *Details in Bulletin No. 97. Ettco Tool Co., Inc., 590 Johnson Ave., Brooklyn 37, N. Y.*

Tool Up Any Drill Press For Fast, Accurate Tapping



Ettco-Emrick tapping attachments can be mounted on any drill press. Newly patented friction clutch provides the delicate sensitivity needed for high speed tapping or threading. 7 different models for No. 6 to ⅝" dies and for No. 0 to 1" taps. *Details in Bulletin No. 22. Write Ettco Tool Co., 590 Johnson Ave., Brooklyn 37, N. Y.*

PRECISION CIRCULAR CUTTERS

MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

Built to Withstand Hard Use

STRONG RIGID BENCHES For Light Machinery and Assembly

Mitchell PORTABLE ★ FOLDING PLATFORMS

Quick, Easy Set-up

Will support a uniformly distributed load of more than 200 lbs. per square foot without sag or wobble.

Five-ply fir plywood, smooth varnished tops with edge moulding. Tops reinforced with sturdy steel channel. Folding leg assemblies of high carbon tubular steel. Heavy flat steel folding braces. Non-slip rubber feet. All metal parts finished in Bryce Beige durable enamel. Special top sizes and various leg heights available.

Write for complete information

MITCHELL MANUFACTURING COMPANY

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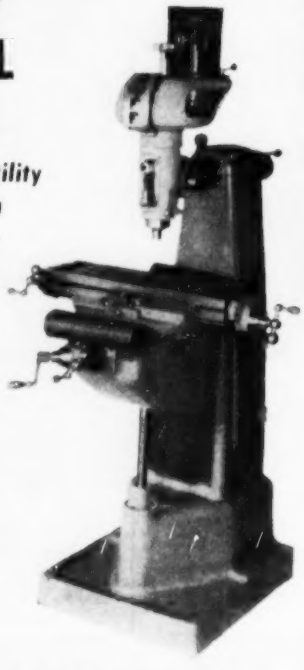
MFGS. OF FOLD-O-LEG TABLES ★ FOLDING STAGES

DUFF VERTICAL MILLER

Universal Head Versatility
Compact in Design
Ease of Operating



RANGE:	
Table size	8" x 24"
Longitudinal Feed	15"
Vertical Feed of Knee	14"
Cross Feed	8"
Maximum Distance Spindle to table	15"
Quill Travel	3"
Collet Capacity	½"
Speed Range 300 R.P.M. to 3200 R.P.M.	
Motor	¾ H.P.
Weight of Milling Machine approx.	1200 lbs.

Write for complete information

DUFF MACHINE CO.

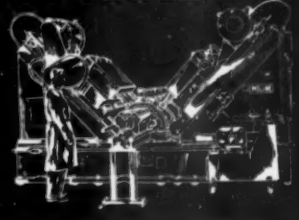
31 WINGATE STREET, HAVERHILL, MASS.

SINCE 1901

MOLINE "Hole-Hog" SPECIALLY DESIGNED MACHINE TOOLS

have cut production costs for American Industry.

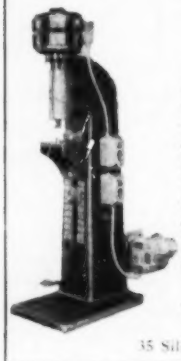
DRILLING • BORING HONING • TAPPING and Special Machines



MOLINE TOOL CO. "HOLE-HOG" MOLINE, ILLINOIS

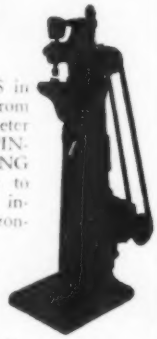
Boring V-8 Engine Cylinders

GRANT



RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
35 Silliman Ave., Bridgeport, Conn., U. S. A.

All we did was to ask a simple question . . .

and E. J. Bowe *said* **"I have no complaints!"**

We wanted to know how Ed was getting along with his battery of 8 of our No. 7 Hand Screw Machines, and the production superintendent of the well-known General R-F Fittings Co. of Boston said something we were mighty pleased to hear:

"We're in a highly competitive field, yet where quality of the part has to be of first consideration. I honestly think that without the help of the Wade No. 7 hand screw machine we never could turn out the large volume of R-F fittings that we do, and with hardly any down-time. We get no complaints from our operators, no complaints from our customers, and you'll get no complaints from me! I like these machines."

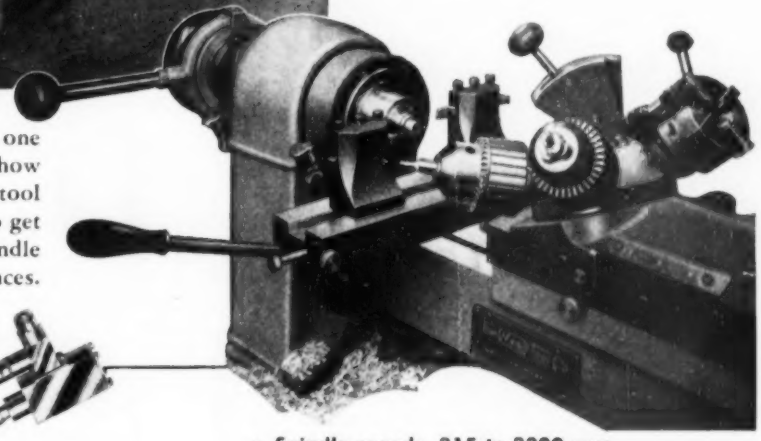
Wade no. 7

HAND SCREW MACHINES

in operation at

GENERAL R-F FITTINGS CO., BOSTON

producers of standard and special co-ax connectors, cable assemblies, wavemeters, crystal mounts, dummy loads, directional couplers, and other microwave components.



Notice this efficient turret set-up for one of the *General R-F Fittings.* See how the cut-away case-hardened steel tool blocks permit the operator to get tools closer to the nose of the spindle and hold closer tolerances.

- **Spindle speeds, 315 to 3300 rpm**
- **1" collet 4-to-1 Hi-Lo Speeds at finger tips**
- **Spindle stops without stopping motor**

If you are doing long production runs on second operation work, and require the holding of close tolerances, we recommend that you write today for our descriptive catalog on the rugged, versatile No. 7 Hand Screw Machine. Address: 53 River Street.

THE WADE TOOL CO.

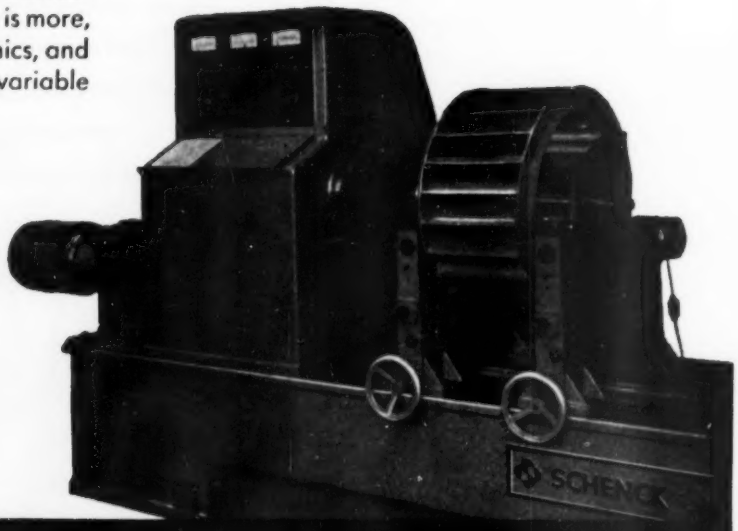
WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

Schenck Balancing Machines

System Schenck-Federn

Let the rotor turn, and the wattmeter will show you all the necessary corrections. With this modern measuring principle outlaw oscillations do not affect the indication. What is more, Schenck machines do without electronics, and they are well suited for balancing at variable and high speeds, too.



CARL SCHENCK MASCHINENFABRIK DARMSTADT GMBH · DARMSTADT

MICRO-HEIGHT GAUGE

for fast, accurate layout

WRITE FOR CIRCULAR AND PRICES

A new precision height gauge which reads like a micrometer and measures zero flush at base. Has a direct reading of 2" with scriber in upright position, and 3" with scriber reversed.

Replace scriber with dial indicator and Micro-Height Gauge measures center distances between holes or surfaces. As indispensable as a micrometer to toolmakers, layout men, and inspectors.

FAIRFIELD GAUGE COMPANY
173 HERBERT STREET
BRIDGEPORT 6, CONNECTICUT

ATTENTION REAMER BUYERS

70 YEARS CHOICE OF TOOL EXPERTS

REAMERS, MILLING CUTTERS, END MILLS, SPECIALS

ALVORD-POLK TOOL CO. Millersburg, Pa.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

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the BIG NAME in Drilling Machines

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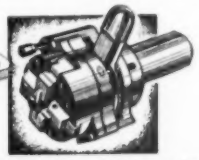
H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 28-40 Barclay St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 334 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

FOR PRECISION STAMPING GO V & O

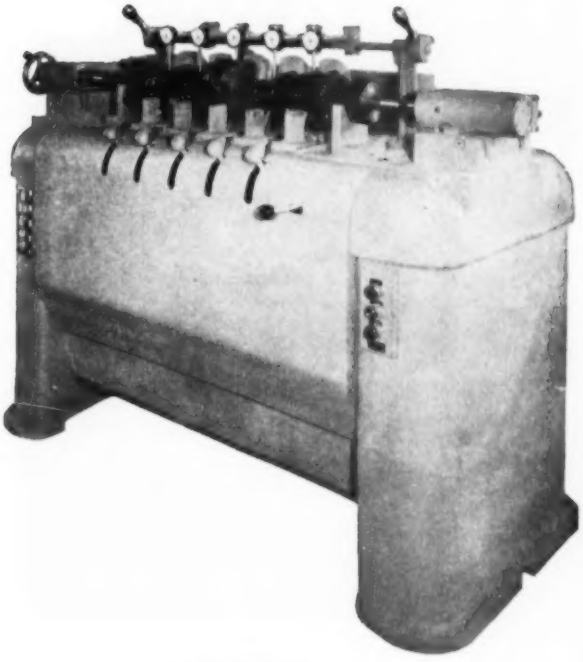
Precision Power Presses and Feeds
Since 1889

THE V & O PRESS CO. *Division of Embart Mfg. Co.* HUDSON, N.Y.

Impco Straighteners

Tailor-Made and Precision-Built For

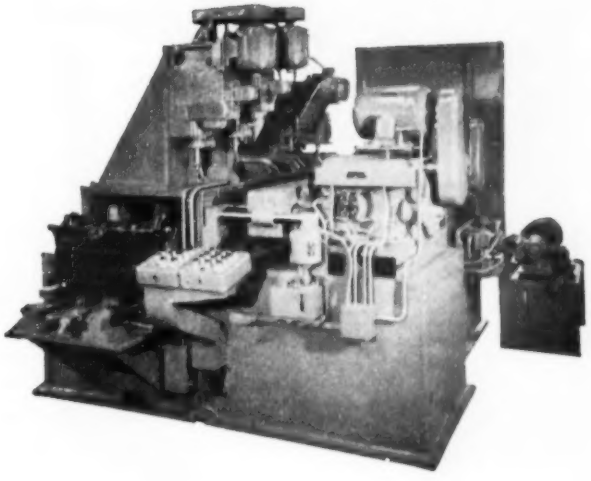
- CRANKSHAFTS
- AXLE SHAFTS
- CAM SHAFTS
- ROCKER ARM SHAFTS
- TRANSMISSION SHAFTS
- OTHER PARTS OF THIS TYPE



IMPCO Shaft Straighteners incorporate a new principle which straightens shafts by pulling downward instead of pressing the point of runout. A battery of dial indicators makes it possible to locate IMMEDIATELY the amount of greatest runout. These indicators, which can be mounted on a common swivel bracket or on anvils with ample over-travel, are so located that they will not be harmed by loading or straightening of the part.

ALL IMPCO Straighteners are driven by means of a hydraulic double vane rotary cylinder. A convenient filler and large cleanout for the hydraulic oil tank are located on the back side of the machine. Moving parts are encased below the working surface for greater safety and compactness. Tailor-made to customer specifications, IMPCO Straighteners are designed to meet special production needs with consistent accuracy, speed, and efficiency.

CUSTOM-BUILT MACHINES to Fit Your Needs



This automatic transfer machine used for drilling, tapping, and trepanning, was built to specification for a leading automobile manufacturer. It handles 60 cylinder blocks per hour net. We offer it as one example of how IMPCO can solve a particular machine problem. Remember, IMPCO will design plans for you, work from your own prepared specifications, or modify existing machines to meet your specific needs.

For Further Information
Contact Your Nearest Sales Representative
Or Write Direct to Company

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22750 Woodward Avenue—Room 305
Ferndale, Michigan

Stong Carlisle & Hammond Co.
1392 West 3rd Street
Cleveland 13, Ohio

1200 Madison Avenue
Toledo 2, Ohio

Ernest, Holdeman & Collet, Inc.
2254 College
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65 Cayugha Avenue
Seneca Falls, New York

Kren Machinery Company
Roselawn Center Building
Cincinnati 37, Ohio

Dawson-Rhoades Thibodeau Machinery Co., Ltd.
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CHAMPION
E-X-P-A-N-D-I-N-G
MANDRELS

Precision Model

Standard Model

give *speed* to every set-up

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

Precision Model has expansion range of .010". Available in regular sizes to fit holes from ½" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

Standard Model maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from ½" to 9½" diam.

CHAMPION *Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.*

WESTERN TOOL & MFG. CO., INC.

Dept. 24 — Springfield, Ohio

Wolverine
Heavy Duty QUICK ACTION TOGGLE CLAMPS

***Extra* CLEARANCE**
***Extra* SPEED**

Rugged construction — drop forgings, cast steel and solid bar stock.

• • •

Wolverine Toggle Clamps also available in several types and sizes of Standard Action and Push Action units.

• • •

Wolverine Clamps are in use in almost every major industrial field and are specified by prominent engineering firms. Write for Bulletin.

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choose

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Fast . . . economical . . . dependable
Complete line of mechanical presses. Since 1863
FERRACUTE MACHINE CO., Bridgeton, N. J.

Buy safe "SHUR-GRIP" drop forged HANDLES

Designed to hold 3 to 6 lb. lead hammer heads more firmly — will not slip — keeps hammer head in shape longer — makes remolding easier, quicker, surer, less expensive.

Write for circular and prices

LAWRENCE H. COOK, INC.
69 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

RE-DESIGNED NEW FEATURES

OLD BORING AND FACING METHODS ARE **OUT!**

NOW
BORING, FACING, TURNING, GROOVING, UNDERCUTTING—
ALL IN ONE TOOLHEAD

Six Sizes — WRITE FOR DETAILS

CHANDLER TOOL COMPANY, MUNCIE, IND.

COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

Communist machine-gun fire dropped him in combat. But whole blood kept him alive, saw him through the hospital. He thanks you for his life.

She'd been exposed to polio. A new serum, *Gamma Globulin*, made from blood, helped ward off the dread disease. She thanks you for her life.

A tornado whipped suddenly across her home town. She was badly injured by falling debris. But a quick operation, several transfusions pulled her through. She thanks you for her life.

Three grateful people say: "We're HERE... because you were THERE!"

Each one of these people is alive today because someone gave blood.

If you've given blood before, you know how easy it is—how quick and painless. And you know what a wonderful feeling it is when you realize that what you've done may give another person his life.

Now you are asked to give blood . . . again and again. And you can do it safely every 3 months.

Because America's need for blood has increased enormously—for our armed forces, for accident and disaster victims at home, for new disease-fighting serums.

Many a life hangs in the balance! Will you help? Call your Red Cross, Armed Forces or Community Blood Donor Center today!

BUSINESS EXECUTIVES CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLANT BULLETIN OR HOUSE MAGAZINE?
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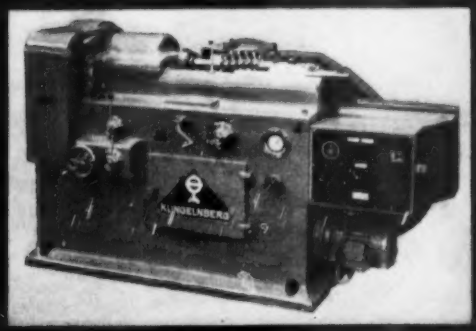

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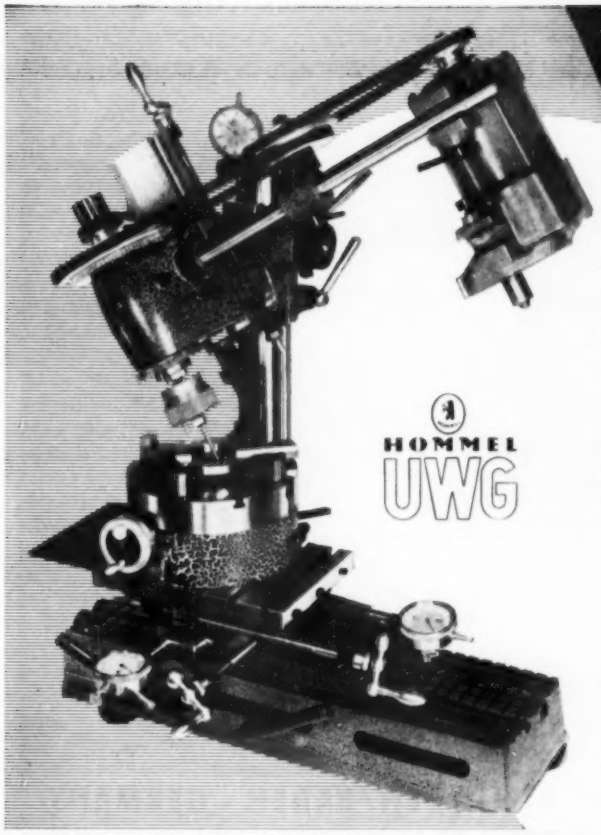

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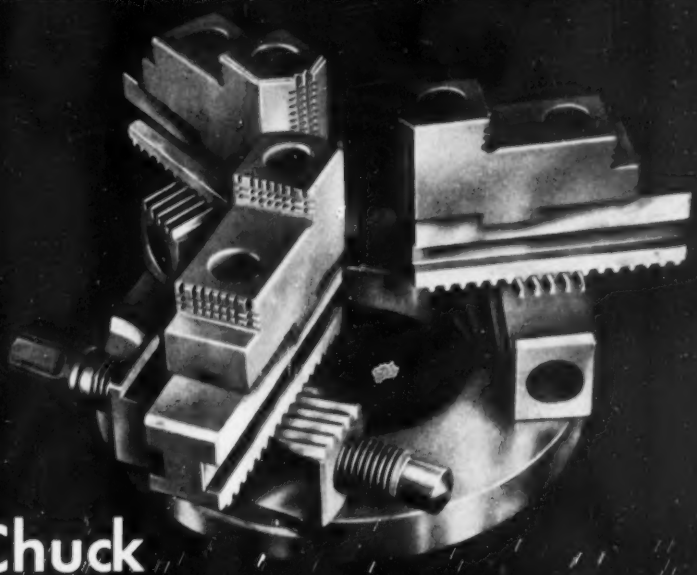

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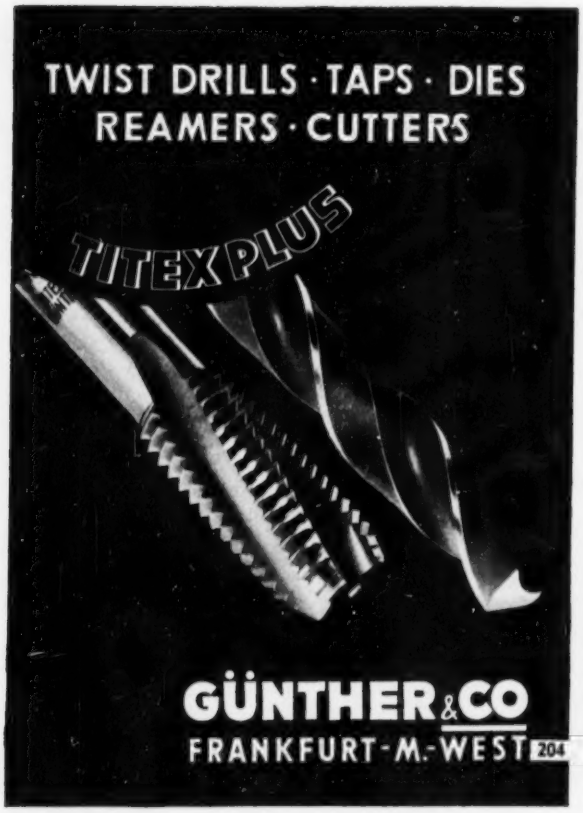

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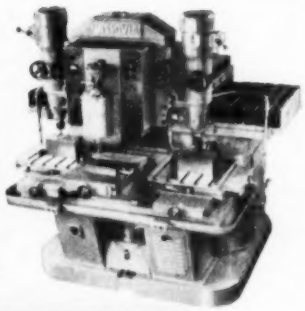

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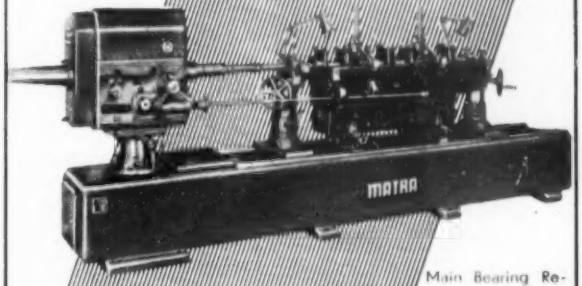

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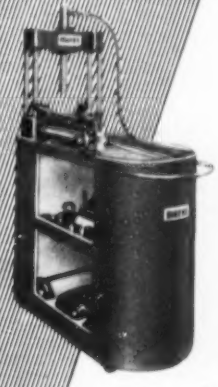

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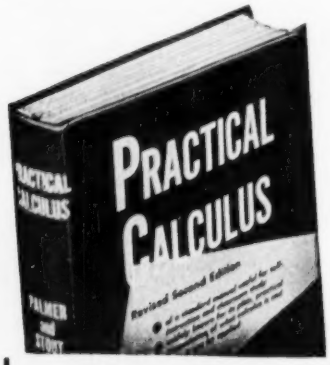

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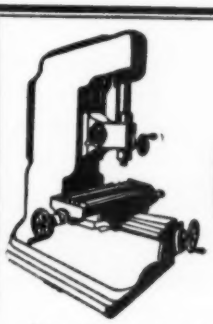

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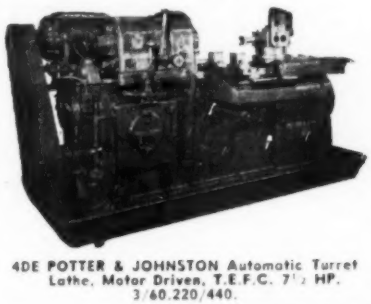

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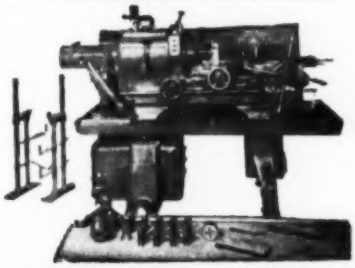
No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head, Bar Feed, 4" capacity through spindle. Late Type, Motor Driven.

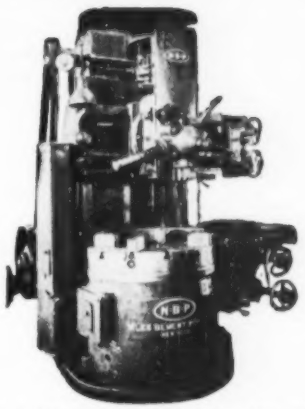


#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, Le-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9'x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type
LATHE, LeBlond 14"x6', Q.C.G., M.D.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, American 16"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x10' Axelson Grd., Late, M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late
LATHE, Putnam 23/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Ledge & Shipley V 26"x84', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd. Hd., M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x18' Pittsburgh Geared Head, M.D.
LATHE, Buffing Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cincl. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, #4 Burke Motor Driven, Late, M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cincl. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-S Cincl. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-6 Auto. Prod.
MILL, #0 Dougics Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd. Late Type Vert. Hd.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cincl. Vertical Hi Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, 42"x96"x12' Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, #136 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 16—48"-54" Morgan, Late.

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7'x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niles Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill, Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #183-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #6 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 79 & 90 tons, New.
PRESS, 135 Ton Clearing Single Crank 8" Str., Late
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #1W.
PRESS, 68 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #6B Whitney Dres. Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles Bement Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1⅝" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".
PUNCH, H & J #4, 48" thr., with Shear Blades.

RIVET SETTER, ⅜" cap. Penn Tubular Rivet.
ROLLS, Bertsch Pyramid 18'x1⅜" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lown Initial M.D., New.
ROLLS, #2 Buffalo Forge Vert. Angle, Bending, New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Radiac "J" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #48 Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, 10"x10" Racine Hydraulic, Late Type, M.D.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cincl., B.G., Motor Driven, H.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model GT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER MACHINE, Type UK300M.
BRINELL TESTER, Type 6DR, Steel City.
WELDER, 500 amp. Westinghouse Flexers A.C.
WELDER, 200 & 400 amps Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Acme, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE IN STOCK

UNUSUAL BUYS WITH GUARANTEED PERFORMANCE

PARTIAL LIST OF LATHES

American 30"x12', 3 SCD, 6' centers.
American 30"x14' G.H., 12 spindle speeds.
American 16"x8' bed, 3 SCD, bowl head.
American 14"x6', 3 SCD bowl head.
American 30"x15' bed Geared Head, 12 spindle speeds, 2-9/16" hole in spindle, vee belt drive.
Boye & Emmes 20"x10', G.H., complete with taper attachment.
Greaves Klusman 22"x8' G.H. Lathe, complete with taper attachment.
Hendey 20"x10' bed Geared Head, 8 spindle speeds, 1½" hole in spindle.
LeBlond 17"x8' bed 3 SCD.
LeBlond 27"x10', 3 SCD Lathe, 3'11" centers.
LeBlond 25/50 x 6/10 Sliding Bed Gap Lathe, G.H., Timken bearing.
Lodge & Shipley 14"x12' G.H., single pulley drive, 12 spindle speeds, 20" centers.
Lodge & Shipley 16"x126" centers G.H., Timken bearing, drop lever handles in apron, late type.
Lodge & Shipley 16"x6', single pulley.
Lodge & Shipley 30" x 12' bed G.H., 12 spindle speeds, 62" centers.

TURRET LATHES

Acme #2 Full Universal, single pulley drive, hole thru spindle 3½".
Acme 5R Universal Ram Type Turret Lathe, bar feed, late type.
Gisholt 1-L Saddle Type Turret Lathe, with bar feed, late type.
Oster 601 Rapiduction.
Libby International 26" swing x 7½" hole Rapid Production Turret Lathe.
Potter & Johnston 6 DRE Automatic Chucker.

BORING MILLS—Vertical

Betts 100", two heads on rail.
Bullard 42", AC motor drive.
Niles 36"-44", 1 rail and 1 side head.
Niles 42"x50" Driving Box Borer, Burnisher and Facer, motor driven, late type.
42-50 Niles Vertical Boring Mill, one rail and one side head, late.

GEAR MACHINERY

Fellows 612 Spur Gear Shaper.
Fellows 725 Gear Shaper, with spur guide.
Gould & Eberhardt 18-H Hobber.
Gould & Eberhardt 96H Gear Hobber.
Gould & Eberhardt 60BM Gear Rougher.

GRINDERS—Cutter & Tool

Oliver Template Tool Bit Grinder, late.
Sellers 4T Tool Grinder, late type.
Sellers 6T Tool Grinder, late type.

GRINDERS—Internal

Heald #70A, new 1941.
Heald 72A3 Plain Internal Grinder, late type.
Heald #78 Centerless Internal Grinder
Micro Internal Grinder, Model F.G.

GRINDERS—Cylindrical

Landis 26"x168" centers Plain, arranged for motor drive with motors, 10 speeds 3 to 62.
Landis #2 Universal, 12"x35" centers, belt drive.

GRINDERS—Thread

Jones & Lamson 8x31, late type.

MILLERS—Auto. or Prod.

Hall Style "D" Planetary Mill, late type.
U. S. Multi-Miller, Model 1-3-2, late type.

MILLERS—Plain

Brown & Sharpe #3, 4 SCD.
Cincinnati #3 Hi-Power, single pulley drive.
Cincinnati #4, single pulley drive.
Douglas #0, rectangular overarm.
Milwaukee 2 HL Plain Mill, late type.

MILLERS—Vertical

Brown & Sharpe #2, single pulley.

MILLERS—Universal

Brown & Sharpe 3A, motor in base.

DRILLS—Radial

American 5'14" column, Triple Purpose.
Fosdick 6'15", Heavy Duty Radial Drill.

PLANERS

Pond 48x48x16' Double Housing, DC drive, 4 heads.

ROLLS

Niles 12'x¾" Initial Type Bending Roll, motor driven with 40 HP motor.

SHAPERS

Averbeck 21" B.G., 4 SCD.
Columbia 28" B.G., gear box drive.
Gould & Eberhardt 20", B.G., gear box.
Gould & Eberhardt 24" B.G., gear box.
Gould & Eberhardt 28" B.G., gear box.
Gould & Eberhardt 32" B.G., gear box.
Potter & Johnston 24" Universal.
Smith & Mills 25" B.G., 4 SCD.

BOREMATIC

Heald #42, late type.

MISCELLANEOUS MACHINERY

H&G Model 1-K Threading Machine, late.
Hobart 200 Amp Arc Welder, late type.
Hoffman Heavy Duty Portable Cleaner.
Speedare 150 Amp Welder, late type.
Tait Pierce Bench Center, 8"x48" centers.

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"GUARANTEED MACHINERY"

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FINE LATE TYPE GUARANTEED TOOLS

28"x15' centers BERTRAM (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC-MD, new 1943.

36"x12' centers AMERICAN Heavy Duty 16 Speed Geared Head Lathe, AC—MD

60"x20' NILES-BEMENT-POND Geared Head Engine Lathe, rapid traverse.

No. 2 WARNER & SWASEY Hand Screw Machine, geared head, power feeds, AC motor in base, Timken spindle.

No. 4L GISHOLT Turret Lathe, 1945.

61" BULLARD Maxi-Mill, Vertical Boring Mill, 2 swivel heads on rail, power rapid traverse, 20 HP AC motor drive.

42" BULLARD, Vertical Boring Mill, extra high column, Serial No. 12938

No. 2 CINCINNATI Vertical Mill, dial type, new 1945

No. 3-24 CINCINNATI Plain Hydromatic Mill, AC-MD

No. 4 KEARNEY & TRECKER Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse.

No. 4 CINCINNATI Hi-Power Vertical Mill, No. 50 taper, power rapid traverse, AC motor

No. 4H KEARNEY & TRECKER Vertical Mill, new 1944

5" bar KEYSTONE Horizontal Boring, Drilling & Milling Machine, new 1942.

48"x48"x10' NILES Double Housing Planer, box table, DC reversing motor drive.

48" widened to 69" x 12' DETRICK & HARVEY Double Housing Planer, box table, DC reversing motor drive

No. 2 BROWN & SHARPE Surface Grinder, motor inside base, power feeds.

25A HEALD Rotary Surface Grinder, 24" diameter magnetic chuck, AC-MD.

14" x 48" MATTISON Hydraulic Surface Grinder, magnetic chuck, AC motors, 1940

36" OHIO Dreadnaught Shaper, AC-MD.

1½" LANDIS Bolt Threader, leadscrews, AC-MD.

30" MORTON Hydraulic Keyseater, new 1942

600 Ton CHAMBERSBURG Wheel Press, cast steel frame, inclined, AC-MD

O'CONNELL MACHINERY CO.

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ELECTRIC FURNACE TO 1850°

with Auto Temperature Control. Sliding door. Cheap to operate. Substantial Dependable for Machine Shop, Tool Room.

8" x 12" x 15" inside 4.5 K.W. $250.00
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Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 B31 Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

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Eastern Rebuilt Machine Tools

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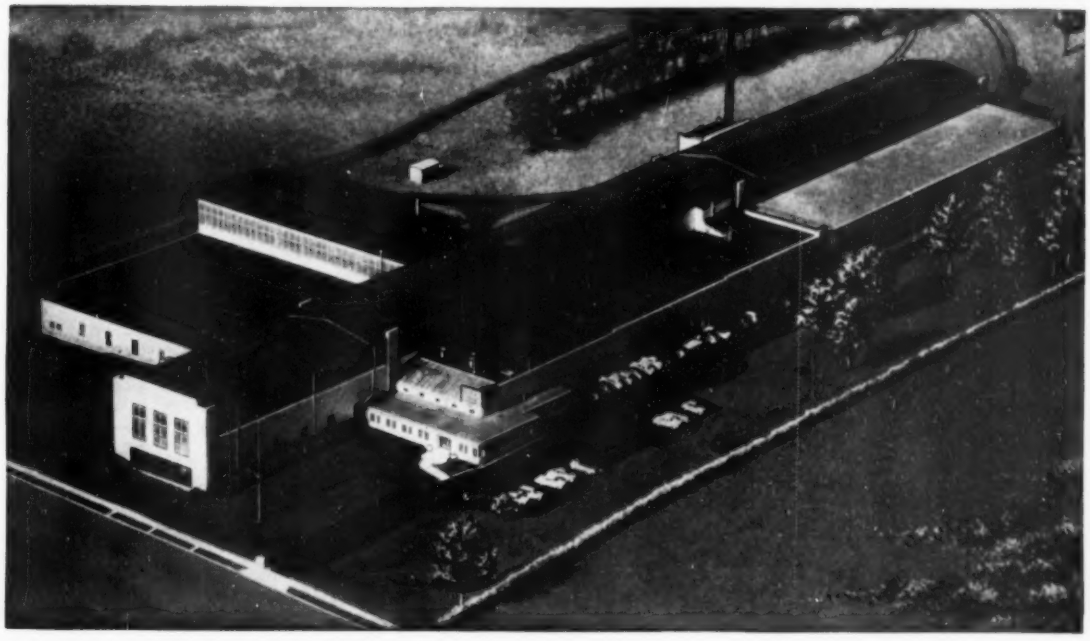


MULTIPLE SPINDLE DRILLS

Foote-Burt 3 spindle Staybolt Drill
C13 Natco, m.d., 16x24" rect. head
No. 3 Baush, m.d., 16x30" head, 6 spindles
No. 3 Baush, m.d., 20x40" head, 6 spindles
No. 16 Foote-Burt Fixed Center, m.d.
3 spindle Rockford Gang Drill, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 28" Cinti. Bickford Upright Drill, m.d., No. 4 Morse Taper
4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper
No. 924 W. F. & John Barnes Vertical Drilling, Boring, Facing & Reaming Machine, m.d.

UPRIGHT DRILLS

D6 Colburn Heavy Duty, m.d.
21" Cincinnati, belted, m.d.
24" Aurora, belted m.d.
24" to 36" Cincinnati-Bickford, m.d., upright sliding head
26" Aurora, m.d., taper
32" Aurora, belt drive
36" Cincinnati-Bickford, belt drive
No. 2 Colburn Mfg. Type, belted m.d.
No. 315 Baker Heavy Duty, s.p.d.
No. 417 Baker, m.d., later type
No. 513 Baker, m.d.
#4—48" Defiance Machine Co. Drill, m.d.
No. 16 Foote-Burt Hydraulic Platen Type Single Spindle Prod. Drill, m.d.
4D-12 Edlund, m.d.

GEAR SHAPERS

No. 12 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61 Fellows, belted m.d.
No. 61 Fellows, gear box, m.d.
No. 61A Fellows, m.d., latest type
No. 64S Fellows, m.d.
No. 615 Fellows, m.d.
No. 615A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, belt
No. 75 Fellows, m.d.
No. 712 Fellows, m.d.

GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical
No. 13LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine Co., m.d., latest

GEAR HOBBING MACHINES

No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman Double Overarm, m.d.
No. 12 Barber-Colman Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d., Spur & Spiral
Pfauter Gear Hobber, Model RS 1, m.d., new
No. 3 Newark Gear Hobber, Plain Type, m.d.
Model 3 Gleason Gear Generator, m.d.

GEAR CUTTERS

GLEASON Spiral Bevel Gear Rougher, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.

GEAR TESTERS

No. 1 Brown & Sharpe Spur Gear Tester
12" cap. National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.

AUTOMOTIVE GRINDERS

Kwik-Way Model H Piston Turning & Grinding Machine, m.d., late
No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d., late

CENTERLESS GRINDERS

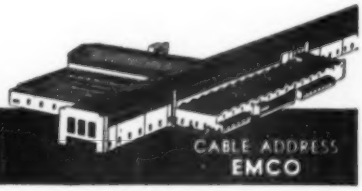
No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 3/8" valve stems, m.d.

DISC GRINDERS

Model 120A Gardner, double spindle, m.d.
No. 2 Gardner, belted m.d.
No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
No. 20 Gardner Comb. Disc Grinder & Roll Sander, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
No. 124—53" Gardner, m.d., vee belt
14A Gardner Grinder, m.d.

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK AUTOMATICS, BOLT THREADERS, HAMMERS, HONING MACHINES, PLAIN AND UNIVERSAL CYLINDRICAL GRINDERS, SURFACE GRINDERS, CYLINDER GRINDERS, INTERNAL GRINDERS, TOOL & CUTTER GRINDERS, MFG. LATHES, ENGINE LATHES, MILLING MACHINES, PIPE MACHINES, PRESSES, PUNCHES & SHEARS, PLANERS, SAWS, RAILROAD MACHINERY, SHAPERS, SLOTTERS, TAPPERS, TURRET LATHES, ETC.

WRITE FOR COMPLETE STOCK LIST



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RELIABILITY has been earned by WIGGLESWORTH MACHINE TOOLS

AUTOMATICS

2⅝" Cone 4 spdle., well equipped, 1936.
#24 New Britain 4 spdle. chucker, 2½" cap
¾" Model F Gridley, 4 spdle.

2" 4 SPINDLE CONEMATIC, THREADING SPDLE., TAPPING ATTACHMENT, BAR FEED, CONSIDERABLE TOOLING. EXCELLENT CONDITION. 1943

BORING MILL

36" Bullard New Era, rail & side head
42" Bullard New Era, rail & side head

GRINDERS

10x36" Norton type C, mech. infeed, late
#444 Van Norman rotary surface, 22" dia
#76RA Rogers knife grinder, 76", late
Cinn. Internal, 24" swing, 78" stroke
14" Hammond WD carbide tool, late
#104 Rivett Universal, 1942, rebuilt
#4 Bryant Internal, auto. sizing
#86—30" Gardner vert. disc grinder
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
P & W deep hole drill grinder, late
Model 1311 P & W contour, late

DRILLS

Type 14 Natco, 12 spdle., #4 M.T., inline head
Type 14 Natco, 4 spdle., arr. for 12, #3 M.T.
#12 P & W, 9 spdle., #2 M.T., power feed
D-4 Colburn, #5 M.T., 3½" cap., 24" swing
5'13" Cinn. Bickford, mtr. on base
28" Cinn. sliding head, round col., older
Baker Hvy Dty, #5 M.T., p.t.
#2LMS Leland-Gifford, 26", hydraulic
#2 Allen, 2, 4, 6 spdle., #2 M.T.

GEAR MACHINERY

6" Gleason straight bevel generator
13LS Fellows lapper, late
7A Fellows, shaper high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES

Connel Dengler spinning, 20" swing, 15 HP
15 x 60" Cinn. Tray Top, toolroom, 1951
42"x26' ctrs American, High Duty, 16 speeds
30"x10' American geared head, taper att.
48"x35' LeBlond Hvy Dty, taper, late
Gisholt Simplimatic, platen type, late

TURRET LATHES

#3 J & L Univ. bar feed, 2" hole, late
#5 B & O Univ., chuck, pre-selector, late
#1A W & S Univ., 3" hole. #417,756
#1L Gisholt Universal, 3" hole, 1937
Libby type H, 24" swing, 8 spdle, speeds
#2 Simmons Microspeed, air chuck, late
#3 Gisholt Universal, late
#4 W & S, bar feed, serial #342461

SHAPERS & PLANERS

30"x30"x17' Cleve. Openside
48x48x14' Detrick & Harvey dble. hsg.
26" Smith & Mills shaper, 4 step cone

MILLS

#2 B & S Vert., 7½ HP late
08 Cinn. horiz., rise & fall, 1943
08 Cinn. horiz., auto. cycle, 1943
#1½ B K & T horiz., dble. overarm, rebuilt
10C Van Norman Contour
#3 Cinn. high speed dial type, vertical
#3 Cinn. high speed dial type, horizontal

THREADERS

#33 Excello plain external, late
#22 Murchey bolt & pipe, ½ to 2", late
8x16" Hanson-Whitney Universal, mill, late
6x80" P & W miller, splining & milling
#50 Excello Precision grinder, 28x68"
13" Automatic Machinery miller, late
LT636 Lees Bradner mill, 18 x 36", late
1½" Landis, 2 spdle., lead screw type
#31 Excello, diamond dresser, late

FURNACES

Whiting Converter, 2 ton cap., late
Model SP Juthe, gas, 1000° F
Lithdraw heat treat, 1200° F, late

PRESSES

Logan 6 ton, C-frame, hyd., 12" stroke, late
#37 Excelsior dble. crank, 45 ton
250 ton Elmes hyd. shell nosing, 21½" str
Ferracute type EG-52 embossing, 150 ton
#4 Toledo OBI, 25 ton. 2" stroke

MISCELLANEOUS

MAGNAFLUX: MA-3 production type, 3000 amp.
WELDER: 75KVA Thompson Gibbs spot, 18" throat
TAPPERS: Haskins 2CAM, 5/16" late
Cleve. Model EQ, ½", late
KEYSEATER: #6-38 Mitts & Merrill, 4 x 36"
WELDERS: Hobart and P & H Arc, 400 amp
BULLDOZERS: #2 Ajax High Speed, 30 ton
SAW: 34" Espen-Lucas, 1945

T. R. WIGGLESWORTH MACHINERY COMPANY
1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 656 New Britain Chucker, 1943.
1½" 6 Spdl. Cone Automatic, 1941.
2" Model A Cleveland, 1941.
1-1/16" Model A Cleveland, 1943.
No. 00G Brown & Sharpe, 1941.

BROACHES

HP-100 La Pointe Horiz. Broach, 1945.

DRILLS

3'-11" Archdale Radial, 1947.
Ma-6 Avey 4 Spindle, H.F., 1941.

GEAR EQUIPMENT

No. 3 Barber-Colman Hobber, 1940.
No. 7 Gleason "Revex" Rougher, 1943.
No. 6 Gleason Revacycle Generator, 1940.
No. 72 Fellows H.S. Gear Shaper, 1942.
No. 61 Fellows Gear Shaper, 1942.
10" Pratt & Whitney Hyd. Gear Grinder, '42
SG-11 Geargrind Spline Grinder, 1942.

GRINDERS

10"x18" Norton Plain Type "C", 1940.
6"x30" No. 12 B & S Hydraulic, 1940.
No. 72A-3 Heald Int. Extended Base, 1942.
No. 72-A3 Heald Plain Hydraulic, 1942.
No. 24-36 Bryant Hydraulic, 1943.
No. 16A28 Bryant Hole & Face, 1942.
No. 16 CP 16 Bryant Hydraulic, 1942.
No. 172 Heald Hydraulic, Gap, 1940.
No. 24D Hanchett Duplex Rotary, 1943.
No. 16A Blanchard Auto. Surface, 1942.
Cincinnati Centerless Lapper, 1942.
HRS Barber-Colman, 1942.
No. 35 Excello Precision Thread, 1942.
No. 7 Grand Rapids Universal, 1942.

GUN BARREL MACHINES

No. ½ B x 50 P & W Reamer, Latest.
No. ½ B x 30 P & W Reamer, Latest.
No. ½ B x 30 P & W Rifler, Latest.

LATHES, ENGINE

27"x192" Niles Timesaver, 2 Carr, 1941.
27"x96" Niles Timesaver, 1940.
26"x180" Betts Bridgeford, 1940.
26"x96" Betts Bridgeford, 1940.

LATHES, PRODUCTION

8"x84" Lo-Swing Semi-automatic, 1941.
No. 3A Lodge & Shipley Duomatic, 1942.
No. 1F U Foster Fastermatic, 1942.

LATHES, TURRET

16" Bullard VTL, Spiral Drive, Late.
No. 1A Warner & Swasey Saddle Type, 1941.
No. 1L Gisholt Saddle Type, Late.
No. 2A Warner & Swasey Saddle Type, 1943.
No. 2A Jones & Lamson Saddle Type, 1943.
No. 3R Gisholt Universal Saddle Type, 1943.
No. HS Libby Universal Saddle Type, 1939.
No. 5 Gisholt Universal Ram Type, 1942.
No. 4 Gisholt Universal Ram Type, 1940.
No. 2M-50 Warner & Swasey Ram Type, 1941.

MILLS, BORING

No. 41 Lucas Horiz, 1941.

MILLS, PRODUCTION

No. 1848 Milwaukee Duplex, 1942.
No. 2-18 Cincinnati Automatic, 1942.
No. M-18 Milwaukee, 1943.
M-18 Milwaukee, 1943.
No. 3 Cincinnati Univ. Dial Type.
No. 8R CINCINNATI Rise and Fall, 1942.
8x16 Hanson-Whitney Thread, 1939.

MILLS, TOOL ROOM

No. 1 Van Norman Plain, 1942.
No. 22L Van Norman Plain, 1943.
No. 2 Saimp Vertical New.
No. 2 Saimp Universal, New.
No. 3 Saimp Plain & Vertical, New.
No. 4 Saimp Vertical, New.

PRESSES

Verson 650 Ton Double Action, 1940.
No. 168½ Toledo Toggle.
No. 166 Toledo Toggle.

SHAPERS

12" Ohio Heavy Duty Univ, 1951.
16", 20", 24" Gernetti Universal Shaper, New.

Partial Listing — Write for latest stock list

INDIANAPOLIS Machinery & Supply Co.
1961 S. Meridian St. • • Indianapolis, Indiana

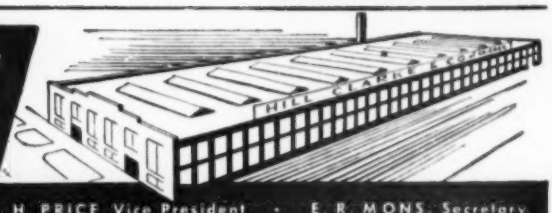
4¼" ACME GRIDLEY Single Spindle Model L Automatic
3'11" DRESES Radial Drill—Motor on arm
16"x8' MONARCH Geared Head Lathe
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers American Heavy Duty Lathe
No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x22" LANDIS Type C Hydraulic Plain Grinder —1942
Nos. 4D & 6S POTTER & JOHNSTON Automatic Lathes
Nos. 8A and 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 26 VAN NORMAN Universal Miller
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 5 CINCINNATI Plain High Power Miller
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P&W Model C Thread Miller
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver 1943
No. 36BM GOULD & EBERHARDT Gear Rougher
16 20" GOULD & EBERHARDT Industrial Shaper
100" BETTS Vertical Boring Mill, 2 heads.

WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St., Cambridge 41, Mass.

NILES TIME-SAVER LATHE
Late Type
27" x 16' between centers
WINSTON MACHINERY CO., INC.
326 W. Ohio St., Indianapolis 2, Ind.

FOR SALE
#4—K. & T. PLAIN MILL—(Heavy Duty) Motor in Base—Timk. Bearing—Vert Attach.
#3V REED PRENTICE VERT. MILL Late Type —Collets.
24" BULLARD VERT. TURRET LATHE
MUNICIPAL TOOL & MACH'Y CO.
1625 N. Broadway, St. Louis 6, Mo.

HILL-CLARKE MACHINERY COMPANY



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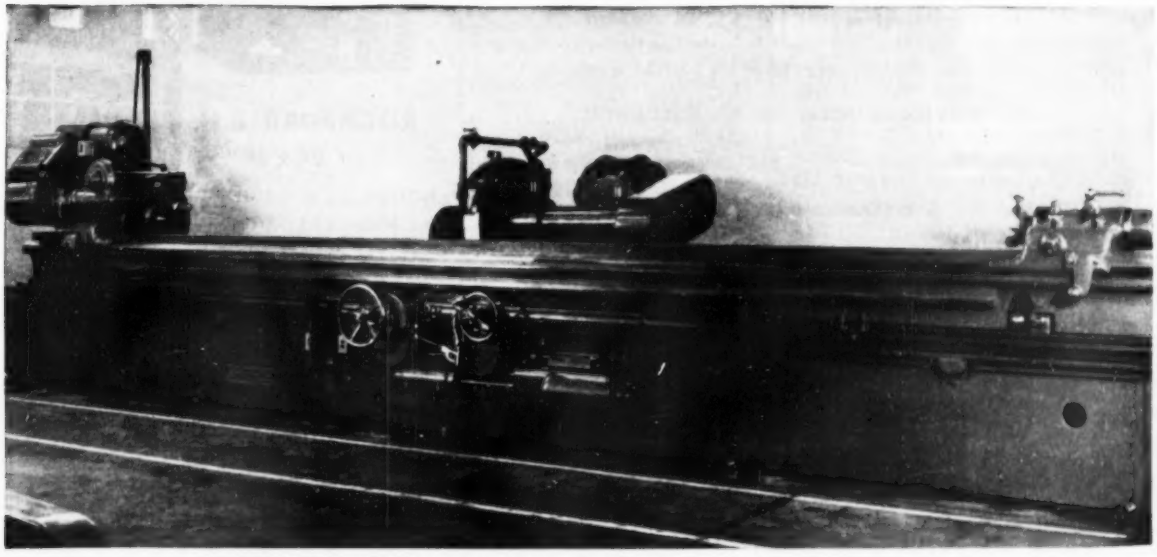

NORTON CYLINDRICAL GRINDER 24" Swing x 264" (22 feet) between centers

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—14" Sw—No. 2 Avey Cam Fd.
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl—24/ Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10"x36" Norton Type C. Cam. Grdr.
10" x 48" Norton type C (1943)
Hill-Clarke Cylindrical Grinders
10"x36" centers
10"x72" centers
18"x96" centers
24x32 Gap x 144" centers
14"x36" centers 14"x72" centers
14"x96" centers 18"x96" centers
20"x96" centers
24"x264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951)
(9" swing—1" bore x 3½" grind stroke)
No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.

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•

Your Worn Machines Can Be "NEW" AGAIN

•

HILL-CLARKE
Gives You the Finest Re-manufacturing Obtainable

No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

BORING MACHINES

No. 45—4½" Giddings & Lewis Hor. Bar
100" Niles-B-Pond Vert. Bar

LATHES

16"x33" R-14 Seneca Falls Auto. Lathe
18"x6' American Geared Head Lathe
18"x10' Lodge and Shipley
19"x8' LeBlond Hvy. Duty Lathe
27"x12' American Geared Hd. Lathe
27"x12' centers LeBlond Lathe
36"x18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7⅛" Hole—Spdl.

MILLING MACHINES

No. 08 Cincinnati Vert. Mill (1942)
54"x30"x16' Ingersoll Slab Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
10"x60" Pratt & Whitney Thrd. Mill
12"x102" Lees-Bradner Thrd. Mill

PLANERS

36"x36"x12' Cincinnati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
60"x48"x27' American, 4 hds.

MISCELLANEOUS

1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—16 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
28" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper

FULL MONEY-BACK GUARANTEE

1. Hill-Clarke always give you and unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.
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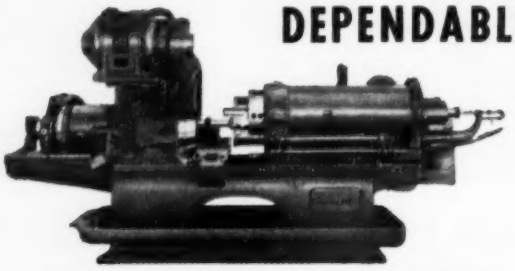
DEPENDABLE LATE TYPE MACHINES

WITH A NOLL GUARANTEE



1⅜" CLEVELAND MODEL "S" S.S. AUTOMATIC

Serial Number 39744-343 — Complete with electrics

SPECIFICATIONS: Solid Chuck Capacity: Round 1⅜". Spindle Speeds: No. 13—196-888 RPM

3¾" CLEVELAND MODEL "A" S.S. AUTOMATIC

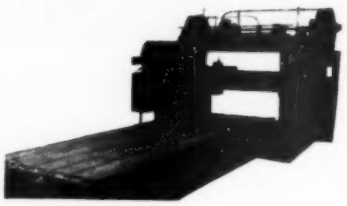
Serial Number 39366-742 — Complete with electrics

SPECIFICATIONS: Chuck Capacity: Round 3¾". Spindle Speeds: Number 48—28-732 RPM. Length Stock Feed Stroke 14"

5¾" S.S. CLEVELAND MODEL "A" AUTOMATIC

Serial Number 38012-342 — Complete with electrics

SPECIFICATIONS: Capacity: Round 5¾". Spindle Speeds: Number 32-33-480. Length stock feed stroke 12½"



ROCKFORD D.H. PLANER

84 x 60" x 18'

MOTORS: 25 hp 3/60/220V—425-860 rpm.

SPECIFICATIONS: 2 Rail heads, 1 R.H. Side head, Bed size—19' long x 5'2" wide, plus 20" piece added to width.

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WRITE, WIRE OR PHONE EXPRESS 1-0700

NOLL EQUIPMENT CO.

4537 ST. CLAIR AVE. CLEVELAND 3, OHIO

MONA

FOR ECONOMY-MINDED PRODUCTION MEN

BALL

OFFERS HEAVY DUTY MACHINES

★ **GRINDERS**

NORTON Cylindrical Grinder 23"x72", M.D., 1942

★ **MILLERS**

CINCINNATI No. 2MH, Universal, 1942
CINCINNATI, No. 4, Vertical Mill—1940
INGERSOLL Planer Type Mill, 24"x24"x 12" 2 Swivel Heads, Adj. Rail, M.D.
INGERSOLL Planer Type Mill, 24"x24"x 96", 3 Heads, Adj. Rail, M.D.
INGERSOLL Openside Planer Type Mill, 42"x42"x16', M.D.

★ **LATHES**

AMERICAN Engine Lathe 30"x124" Centers, Geared Head, M.D.
AMERICAN Engine Lathe 30"x156" Centers, Geared Head, M.D.
SENECA FALLS, Lo-Swing, 8" x 84" cc., Semi-Automatic.

★ **PLANER**

GORTON 36"x30"x8', Box Table, Belt driven

★ **RADIAL DRILLS**

AMERICAN Triple Purpose Radial Drill, 6'-17", Electric Clamping, M.D.
AMERICAN Triple Purpose Radial Drill, 5'-15", Electric Clamping, M.D.
WESTERN Radial Drill, 7', M.D., 1942
WESTERN Radial Drill, 4', M.D.

★ ***THESE MACHINES ARE STILL IN OPERATION AND CAN BE INSPECTED UNDER POWER AVAILABLE FOR IMMEDIATE DELIVERY.***

High Grade Machine Tools — New and Used

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McDONALD

USED MACHINERY

Landis 20"x72" and 18"x96" Plain Ext. Grinders.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W. & S. No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Red Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 13" hollow spindle.
Norton 6x18" Horiz. Hand Sur. Grinder 1941.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
20" All Grd. Camel Back Drill 1-Sp. and Barnes.
Amer. 3' & Morris 3½' Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf Grinder 26" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1947.
Nazel #3-B Vert. Air Hammer A.C. M.D.
Landis 2-Sp. 2" Cap. Belt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Heald #70-A Red Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt # 25 Box. Col. 1-Sp. Hvy. Drill.
L & N, 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 28" stroke openside Shaper Planer.

McDONALD MACHINERY CO.

1531-35 No. B'way., St. Louis 6, Mo.

No. 2 B & S High Speed Autos. M.D.
No. 25 Heald Rotary Surface Grinder.
P & W 30" Vert. 2-spindle Profiler.
Peerless 6½" x 6½" Hack Saw, hyd.

D. E. DONY MACHINERY CO.

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NEARLY NEW (1948)

GLEASON #7 HYPOID CUTTER SHARPENER. Ser. #24768. Hand Index, Hand Feed. Coolant.

W. C. COWDEN MACHINERY CO.

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Phone 37787

OUTSTANDING OFFERING

CLEARING 500/1500 Ton Hydraulic Press, 25½" x 24" stroke down-moving ram, 43" x 52" bed area, 54" daylite, completely self-contained. Inspection under power.

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1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES

SUNDSTRAND: 44" Double End Centering Machine

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
SUNDSTRAND: 44" Double End Centering Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

3-WAY GUARANTEE

1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT, 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

THOMPSON: Hydr. Surface Grinder, 10 x 18 x 24" New

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic. 25½" swing x 27" centers
POTTER & JOHNSTON: #6 DREL Automatic
New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY: 1A, 2A, 3A & 4A
WARNER & SWASEY #3, #4 & #5 Turret Lathes
HERBERT: #2, #4, #7, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI Hydromatic Duplex, Rise-and-Fall, 34-36, Tracer Control
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole.
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

ARTER CARBIDE Tool Grinders
OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used.
AUTOMATIC SCREW MACHINE, Swiss type, ⅝"—used
AUTOMATIC SCREW MACHINE, Wickman, Single Spindle, 7/16", New
CENTERING MACHINE: Sundstrand, 44" Double End.
CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
WIRE FORMING MACHINES: 4 slides (new)

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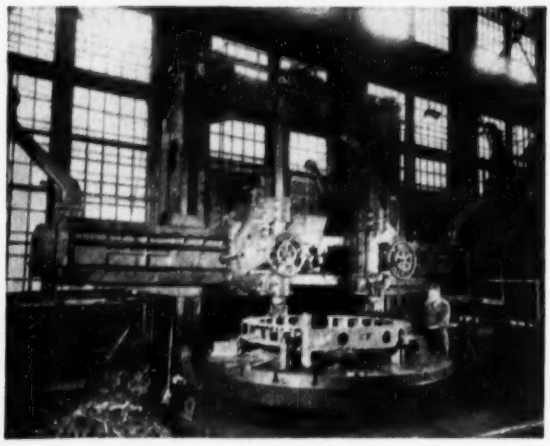
MACHINE TOOL ENGINEERS SINCE 1919

NILES 144"-2 HEAD VERTICAL BORING MILL



RECENT ADDITIONS TO STOCK

BORING MILLS

Bullard 34" New Era Vert. Turret
Bullard 24" M.D. New Era. Vert Turret

GRINDERS

Cinn. No. 4 Centerless, Thru-feed
Blanchard #16A Vertical Surface
Norton 10"x36", 18"x50", 14"x96" Plain
10" P&W—Doublewheel, Gear
#11 B&S Plain Cyl.
#13 B&S Univ. & Tool
#2 and #3 B&S Universal

MILLERS

Rowbottom up to 32" M.D. Cam Miller
Potter & Johnson 2M Horiz. Auto.
Cincinnati 08 Plain Horiz. M.D. Production with Rise and Fall Attachment.
#3 Cinn. M.D. Vertical
#3A B&S M.D. Universal
6"x80" P&W M.D. Thread

PRESSES

Henry & Wright 50 ton M.D. Dieing
Clearing Model DS-1500-60, 500 Ton Double Action Press, 1942 Machine
Cleveland 400 Ton #4K Knuckle Joint

LATHES

Reed Prentice 20"x54" centers Geared Head, Q.C.G. 16 Speed.
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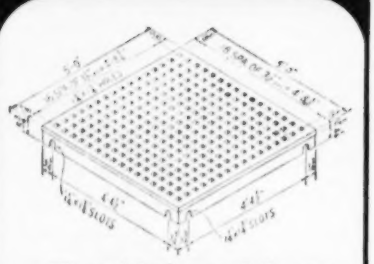

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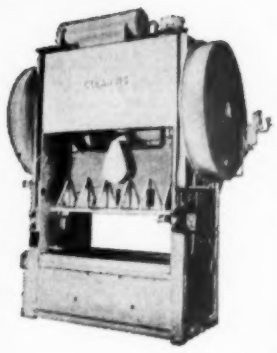

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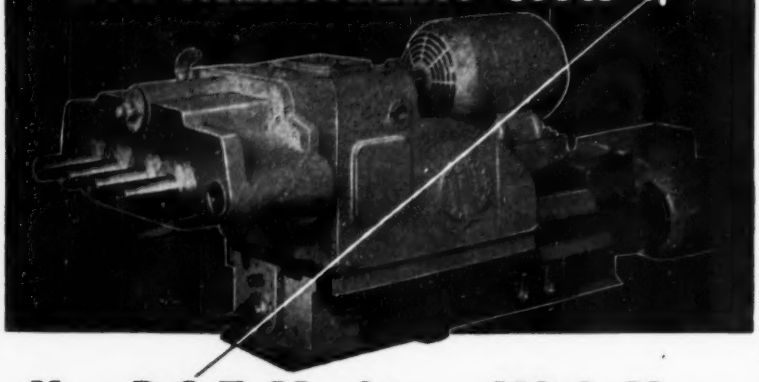

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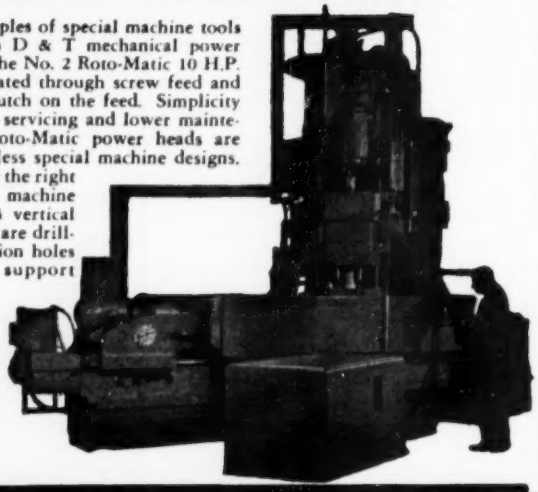

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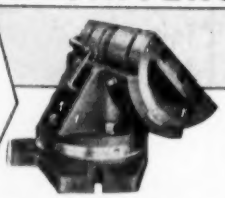

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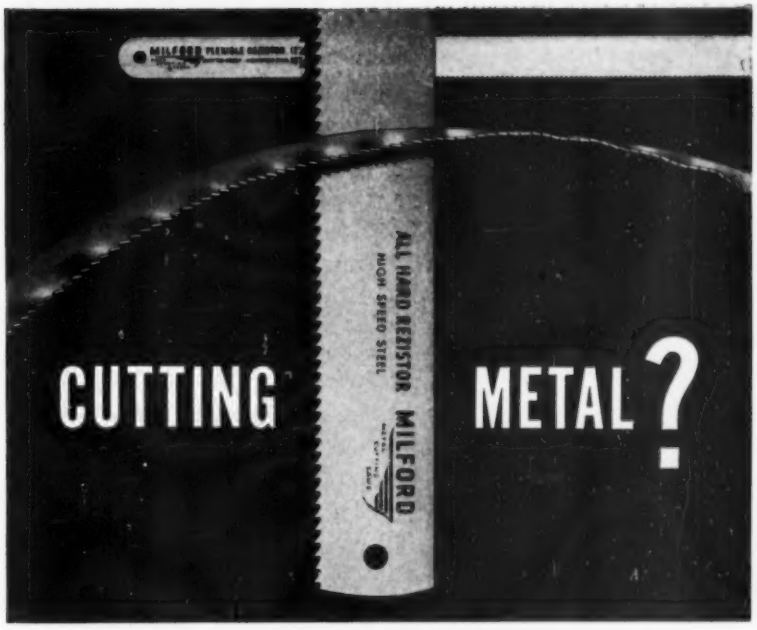

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8	24-30-36-38-40-44-48
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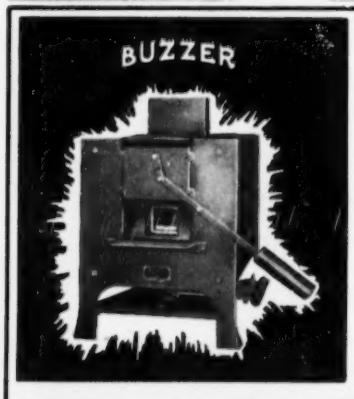

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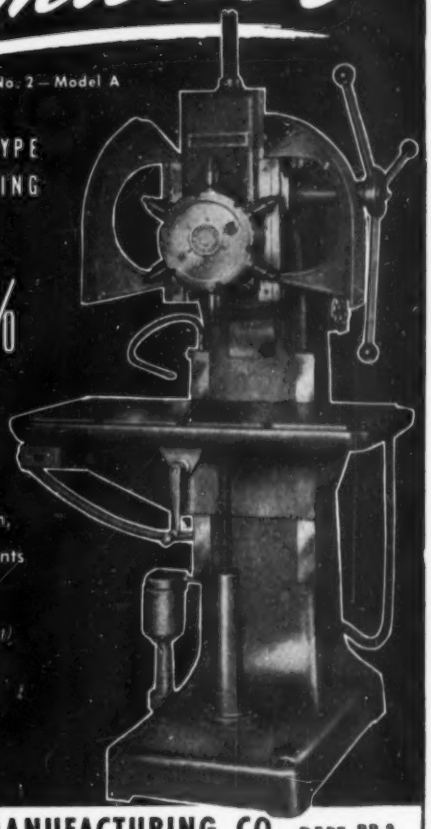

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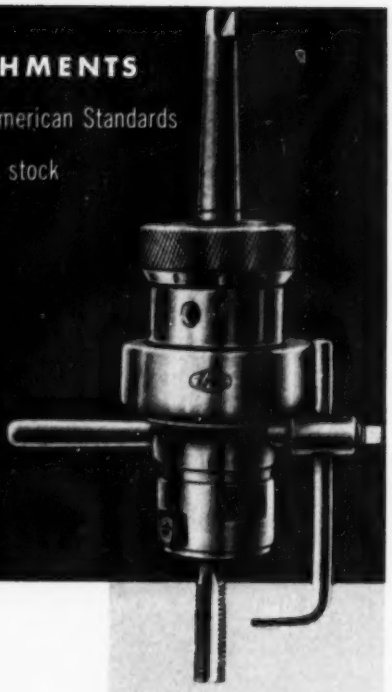

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CARBON AND ALLOY STEEL BARS
Uniformly satisfactory in service because—
Machinability is outstanding
Tolerances are uniformly close
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RIGID QUALITY CONTROL

●One important reason why Youngstown Cold Finished Bars are so uniformly satisfactory is that their production is under the sole supervision of a single integrated organization—from mining the ore to shipping the finished product.

Youngstown Cold Finished Carbon and Alloy Steel Bars are furnished in standard shapes and sizes, either in coils or straight lengths. For further information, phone or write our nearest District Sales Office.

Youngstown

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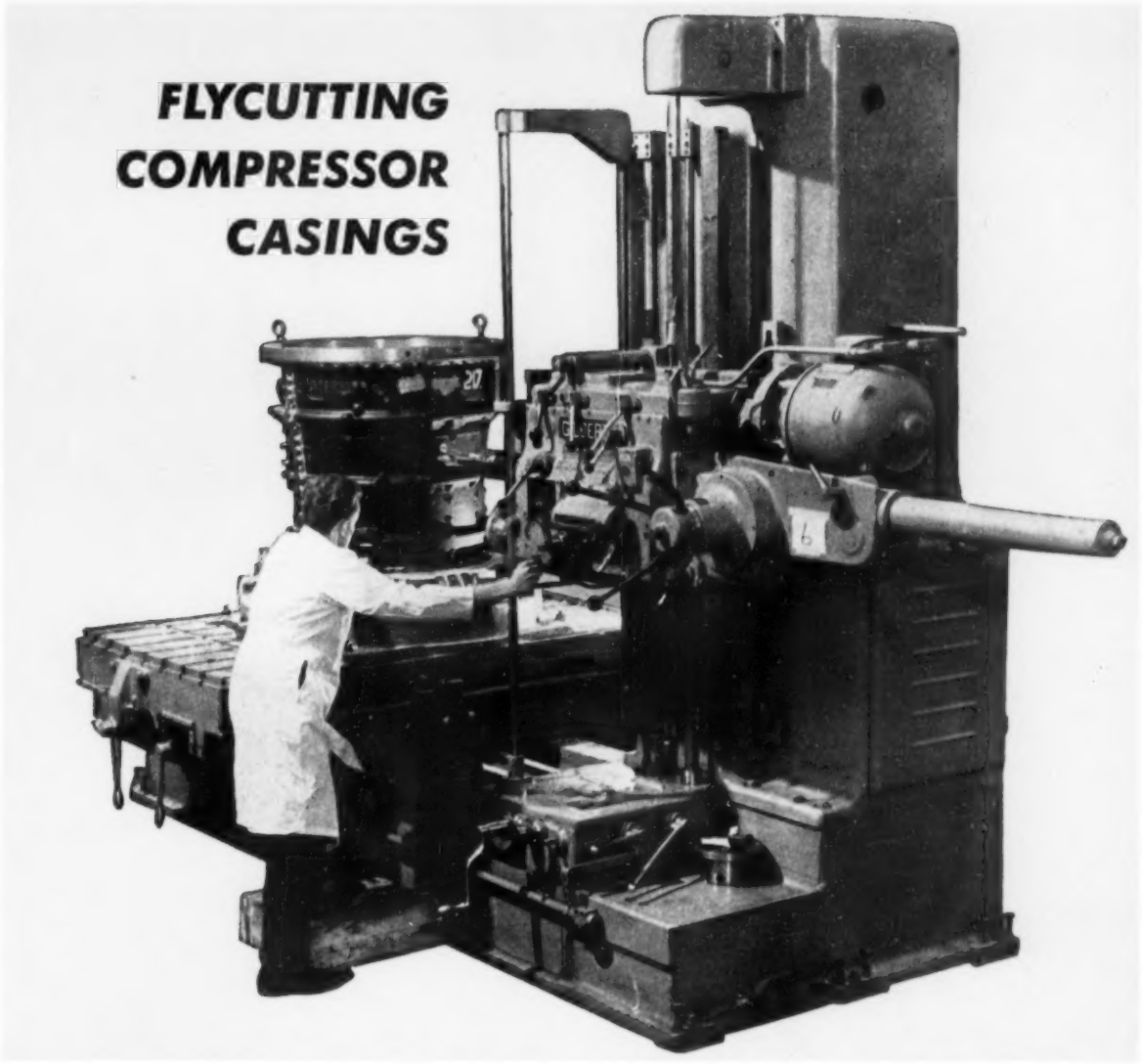


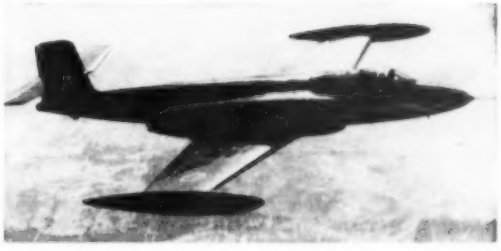
on the

ORENDA JET ENGINE

at A. V. Roe Canada, Ltd., Malton, Ont.

A total of ten Cincinnati Gilbert horizontal boring mills have been installed at A. V. Roe, and four more are on order. These fast modern machines fit the demand imposed by the Orenda Jet Engine production program: high production and accuracy in the extreme. They are delivering the kind of service that supports the statement: "Those who buy Gilbert buy Gilbert again."

Whatever your boring mill or radial drill requirements may be, you'll be well advised to investigate the productive capacity of Cincinnati Gilbert machines. Our representative is always at your service.



THE CINCINNATI

GILBERT

MACHINE TOOL COMPANY

3366 BEEKMAN STREET • CINCINNATI 23, OHIO

Switch to Graph-Mo® ends heat-treating problem, increases gage blank sales!

Graph-Mo steel gage blanks manufactured by HURON MACHINE PRODUCTS, Dearborn, Michigan.

HURON Machine Products was having trouble heat-treating the oil-hardening tool steels it used for making gage blanks. Poor response to heat-treatment was causing cracks in the blanks.

Looking for an answer to the problem, Huron switched to Graph-Mo® steel, a special graphitic tool steel manufactured by the Timken Company.

Here's what happened when Graph-Mo steel was used:

Because Graph-Mo responds uniformly to heat-treatment, the cracking problem was eliminated. But that's not all.

Because Graph-Mo machines faster, machining time was cut, tool life lengthened.

And in addition to cutting production costs, Graph-Mo has helped Huron increase its sales. H. E. Lindemann, Huron president reports: ". . . the acceptability of Graph-Mo by gage users has been an important factor in our company's increased sales."

The difference in Graph-Mo steel and other gage steels can even be seen by the naked eye. The tiny, scattered parallel marks barely visible on the surface of a polished piece of Graph-Mo steel indicate the presence of free graphite in the steel's structure. This graphite, together with diamond-hard carbides, enables Graph-Mo to outwear other tool steels an average of 3 to 1, according to reports from dozens of users.

You can always tell Graph-Mo by its "graphitic look". This built-in trade-mark can't be duplicated in other steels. The next time you buy gages look for the "graphitic look" as well as the tag reading "this gage is made of Graph-Mo steel". The Timken Roller Bearing Company, Steel & Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING